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THE IRON AGE

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THE IRON AGE

THURSDAY, JANUARY 1, 1903

THE WEST POINT FOUNDRY.

Modernizing the Oldest Foundry in the United States.

DESCRIPTION OF SOME OF ITS OLD APPLIANCES.

Until very recently the most interesting foundry in the entire country was the plant of the West Point Foundry, located at Cold Spring, on the east bank of the Hudson River, nearly opposite the West Point Military Academy. In referring to this particular "Cold Spring," it is obligatory to mention the county—Putnam—as there are three other Cold Springs in the State of New York. At all of them the Father of his country drank of the sparkling element and pronounced it pure and cold. They have all remained cold unto this day. The historical statement is proved in the case of this particular spring by a fountain, which looks like some of the shrines seen abroad, erected at the railroad station, which recounts Washington's visit and perpetuates his opinion as to the quality of the water.

The West Point foundry was located here in the early part of the last century, 1817, the site being selected as it was far from the ocean and, therefore, comparatively safe from any attack by invaders, as nearly 60 miles of river would have to be traversed from New York harbor before reaching it. It thus possessed the advantages of ample protection and convenient transportation facilities by water, which was the only means of heavy freight communication in those days. As the foundry was designed with a view to the production of war material, and its safety was a matter of the greatest importance, the Government was interested in the project.

General View of Yard.—New Foundry at Left, New Bridge Department at Right.

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The site is an ideal one, both from picturesque and defensive aspects. The works are distributed about many acres of level ground, bounded on the west by the Hudson and inclosed on the east by a range of impassable hills.

The equipment of the early works was the most modern and up to date. Ample power for the entire establishment was obtained from an overshot wheel, the water supply coming in an open flume or race from the adjoining mountains. Afterward steam was

introduced and this in turn followed by a modern turbine water wheel driving an electric generator. This turbine uses water from the same source as the old overshot wheel, but develops four times the amount of power. So, at the time of the writer's visit, when the accompanying photographs were taken, water, steam and electricity were all in use, and the most ancient source of power worked in harmony with the most recent. In addition, compressed air had been piped through the several departments. But the old water wheel, after many long years of service well performed, will have to make way for its more perfect rival, the turbine.

Fig. 2.—New Coke and Pig Iron Storage Yard.

Those designers of old built wisely and well. During the Civil War the works were run night and day, making the cast guns and shot and shell then in vogue. Although these three essentials of the game of war had changed so that the old had become obsolete, the works were found to be well adapted, with the appliances at hand, for the production of war material, and were also conducted continuously during the late brush with Spain.

In 1896 the well-known firm of J. B. & J. M. Cornell, who furnish a large part of the structural material used in New York City and vicinity, acquired the plant and immediately set to work making improvements. The management wisely decided to retain all that was good of the old machinery and discard only that which was so far behind the times as to be too expensive to operate. The plans embraced an entire revision and rearrangement of the entire outfit, even to the erection of new and larger foundry buildings and the addition of several departments complete in themselves; but no haste was displayed and no serviceable tools were discarded. The two air furnaces, built in 1862, and each capable of melting a mass of iron weighing several tons, the hydraulic press, built in 1840, the steam hammer, and many of the wooden cranes are still preserved. Perhaps most interesting of all, the first traveling crane ever built, and what was undoubtedly the largest cylinder boring mill of its time, are still in place and working. There is also a large pulley or pit lathe still doing good work. Many of these machines were constructed along lines which have since been developed into the representative tools of to-day. But it is only a question of time when these will have to make way for more improved appliances.

Arrangement of Yard.

One of the first considerations to be decided was that of the handling of material—raw and finished. The quickest and most economical moving of all supplies was carefully thought out. A general view of the yard is presented in Fig. 1. This is traversed by tracks leading to the various shops and connecting with the New York Central & Hudson River Railroad. The yard is supplied with an efficient system of overlapping mast cranes. The building at the left of the picture is the new foundry, that at the right being the new bridge shop.

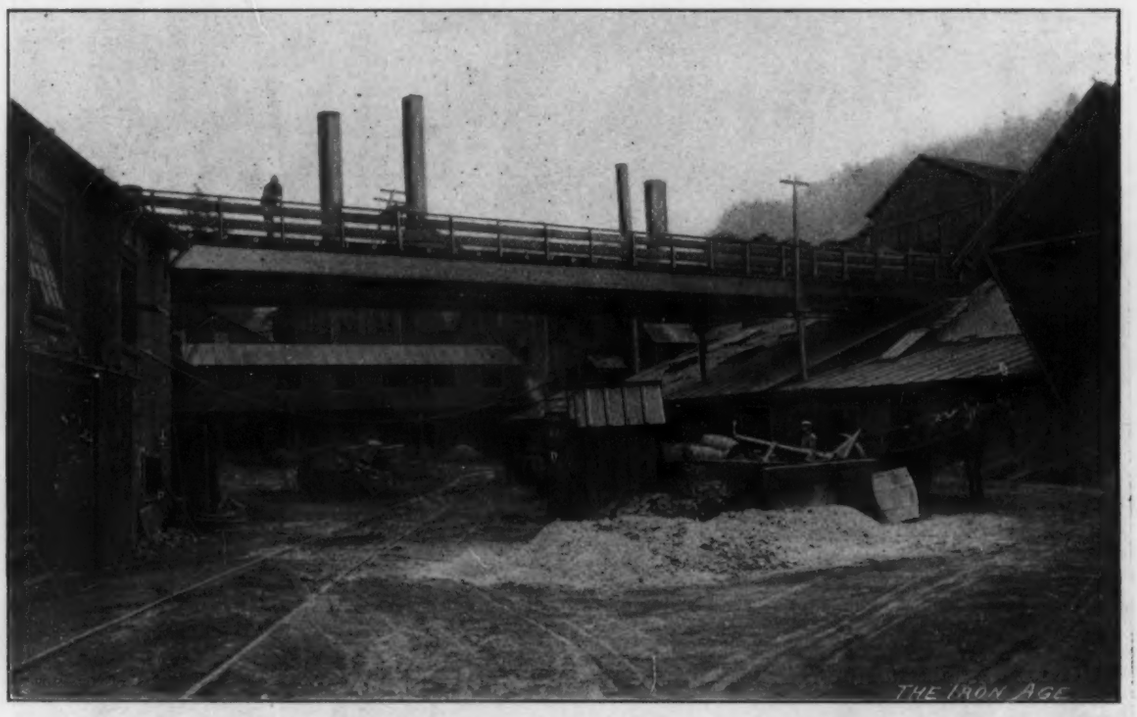

Fig. 3.—View of New Foundry Yard.

It was early decided to deliver all foundry supplies, as far as possible, at such an elevation above the place it was to be used that it could be delivered by gravity and thus lessen the cost of handling. How this was accomplished will be understood from Figs. 2 and 3. In the first are shown the piles of coke and iron. These are located on the side of a hill, up which a branch track leads from the railroad. They are at an elevation sufficient to permit their being delivered to the charging platforms of the cupolas by

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gravity. The lower yard is spanned by bridges, which connect the storage yard with the platforms, and which are provided with tracks, upon which the supplies are carried on cars. By this method the only serious work is that performed by the locomotive, which hauls the cars up the hill.

The sand bins, Fig. 5, are placed on a level with the molding floor, just back of the core room, and in close proximity to the sand sifters.

Cranes.

The cranes shown in Figs. 6 to 9 are of the same general design as far as their frames are concerned, which are built of massive wooden timbers. That illustrated in Fig. 6 is located in that part of the foundry devoted to heavy castings and is operated by a steam engine carried upon the mast. The crane, Fig. 8, is located outdoors, at the eastern end of the foundry and is employed principally for loading and unloading trucks. While it resembles the others in general appearance it can be operated either by the old water wheel or by power from the shop shaft. This is done by a suitable arrangement of gearing. The crane, Fig. 9, is in the department devoted to the finishing of building columns, and connects with the western end of the foundry, shown in the distance in Fig. 17. The columns, after having been cast, are cleaned in the western end of the foundry, finished in the shop just mentioned, and then carried to the storage yard nearby, or are shipped direct. This method is extremely convenient and the columns are moved a minimum distance from the molding floor to their destination.

The crane shown in Fig. 10 is of modern design, built of steel members. These are arranged along the walls

Fig. 5.—Sand Bins.

Fig. 4.—View from Cupola Platform Looking Toward New Storage Yard.

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of the main foundry, at such distances apart that they overlap. These, in addition to standard electric traveling cranes, provide means for the easy handling of all loads over the entire molding space.

In Fig. 11 is shown the blacksmith shop, with the original 18 forges located along the sides. The rear view of one of these forges, Fig. 19, shows the blower connection and levers controlling the blast.

Air Furnace.

One of the two air furnaces is represented in Fig. 12. These carry a name plate bearing the following:

W. P. F.
1862.

The grate is shown at the left. The interior is designed somewhat after the reverberatory furnace, the products of combustion pass over an arch and are then deflected to the melting chamber, from which they pass to the stack. Anthracite is used as the fuel, and only natural draft is employed. The charging is done through the center opening by means of the crane shown. Any mass of iron that will enter the opening can be melted and, although the time required makes the operation rather expensive, as compared with the ordinary cupola, the quality of the casting is enhanced. The cost of this method is somewhat reduced by the fact that scrap like large rolls, which it is impossible to break small

enough to go in a cupola, can be often obtained at a nominal price.

Leading from the tap hole of each furnace is a trough extending to the molding floor, where the molten metal is received in a ladle ready for pouring. These troughs can be united so that the yield of both furnaces can be used for large castings.

Large Pulley Lathe.

The large pulley, or pit lathe, Fig. 13, is served by the hand power crane placed at the right. The pulley is held to a face plate, which is driven by gearing from the overhead shaft. Extending across the face plate at right angles to the spindle is a bed, which, by means of a rack and pinion, is moved toward and away from

Fig. 6.—Steam Crane in Foundry for Large Castings.

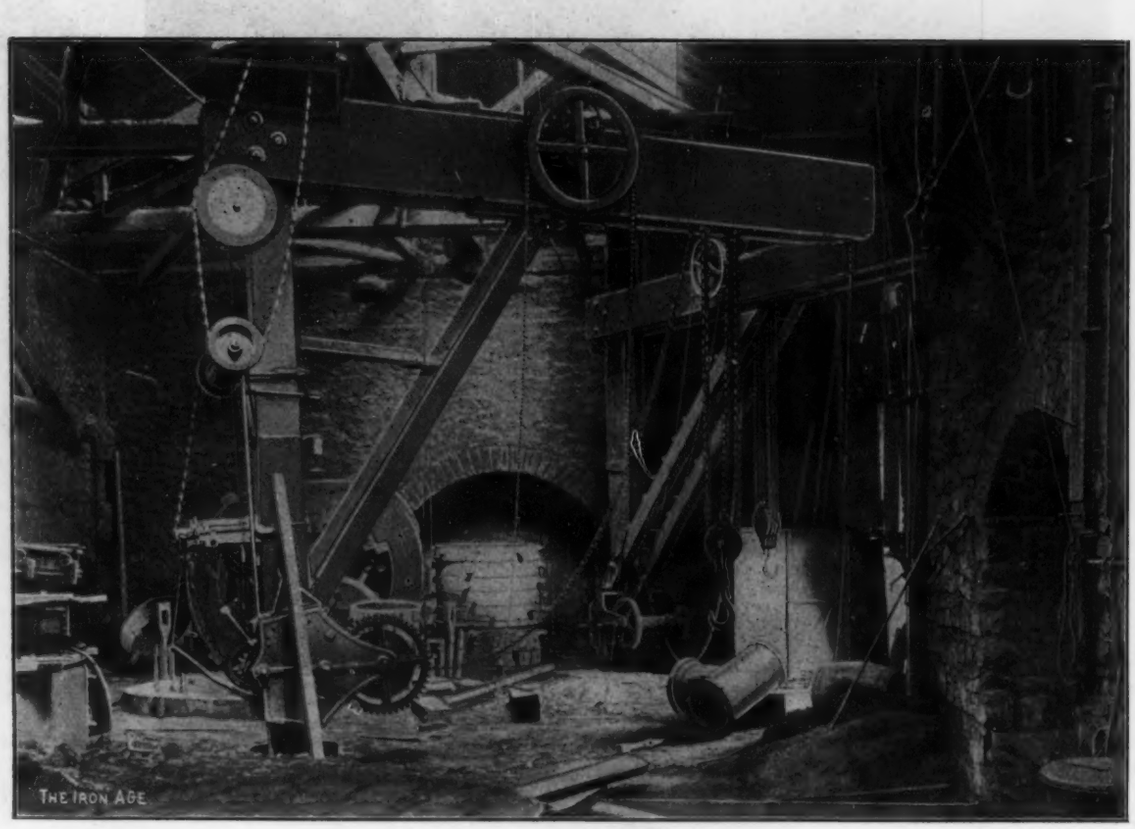

Fig. 7.—Old Crane in Foundry.

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the face plate. This bed carries the tool holder, which, of course, can be adjusted to any position longitudinally of the bed.

Steam Hammer.

The steam hammer, Fig. 14, was made by Merrick & Sons of Philadelphia in 1868, and is now in perfect condition. An examination of the photograph will show that as far as "pleasing and symmetrical appearance" is concerned, some of the designers of the hammers of to-day have not made strides in advance. On the contrary, they appear to have gone backward to some extent. The housings are of the web and flange type of cast iron, united at the top by a plate bolted on and further held by bolts at the side of the cylinder. The distance between the legs, at the level of the anvil, is about 6 feet.

The First Traveling Crane.

What is probably the first traveling crane ever erected is illustrated in Fig. 13. It is used in connection with the boring bar, Fig. 16, of a large boring mill. The size of this mill may be judged from the fact that the cylinders of the Sound steamer "Pilgrim" were bored and faced by it. The traveler consists of a wooden frame built to carry two tracks about 11 feet apart, and about 12 feet above the ground. Extending across the track is a bridge, upon which travels a 4-wheel trolley, which is provided with a screw hoist and cross bar for operating it by hand.

The traveler is brought into use when it is necessary to remove a finished job or place a new one in the mill. A chain attached to the screw hoist is passed around the boring bar, when the trolley is moved to

Fig. 8.—Old Crane Operated by Water or Steam Power.

Fig. 10.—New Wall Crane in Foundry.

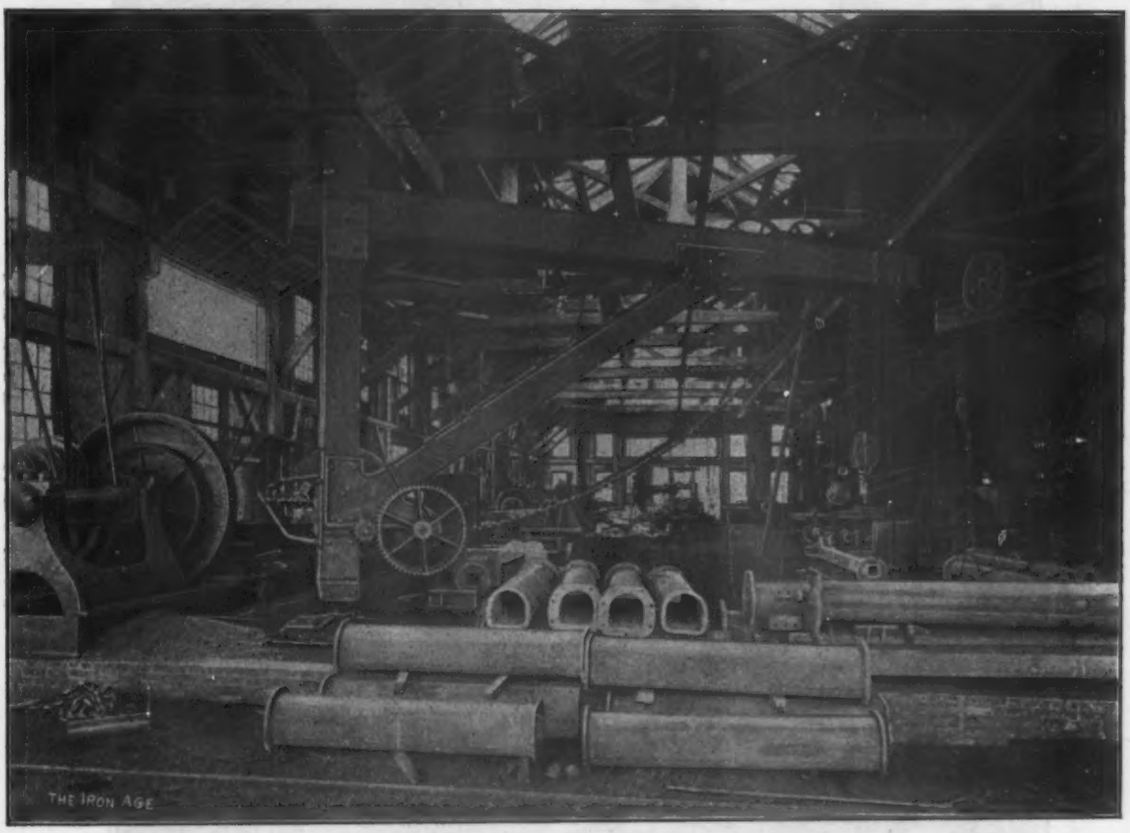

Fig. 9.—View in New Column Department.

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the right in the engraving until its inner end is free of the work.

The three main elements of the latest traveling crane are found in this early example—namely, tracks for longitudinal movement, a bridge spanning the track and a trolley hoist for transverse movement.

Water Supply.

One of the many "cold" springs found in this neighborhood is represented in Fig. 19. This is piped from the hills at the rear of the works. The water is remarkably pure and extremely cold, even on the hottest

Fig. 11.—The Old Blacksmith Shop.

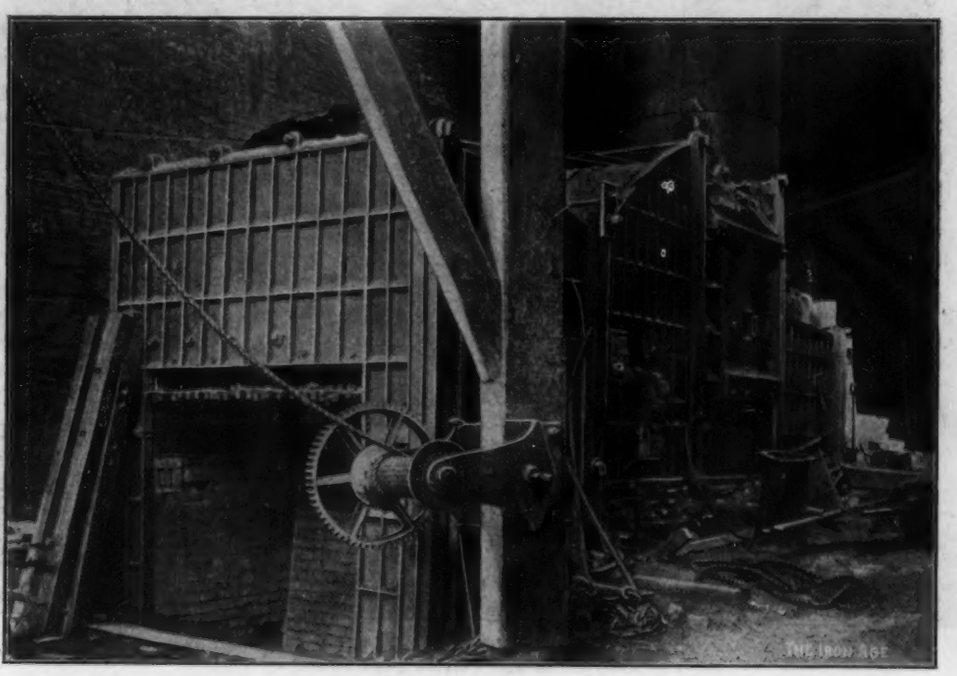

Fig. 12.—Air Furnace, 1862.

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New Foundry.

A general view of the new foundry is presented in Fig. 17, the core ovens appearing in the background in Fig. 18. The cupolas are centrally located, about in line with the camera when the picture was taken. The building is well lighted and, as stated above, is furnished with all the most advanced appliances for handling work expeditiously and economically.

days of summer. It is carried through the shop in pails by boys.

It is to be regretted that the records of most of the old tools here barely mentioned have been lost. This matter, in many instances of historical interest and value, will soon be impossible to obtain at all, since it is only a question of a short time when all of these old tools will have disappeared. S. D. V. B.

The Coke Industry.

BY FRED. C. KEIGHLEY, UNIONTOWN, PA.

Within the domains of iron and steel at this time conditions exist akin to chaos. A score or more furnaces in the Mahoning and Shenango Valleys alone are either banked or out of blast and as a natural consequence mills, foundries and factories all over the country are working but a portion of the time and in some cases are shut down indefinitely. The principal cause for all this trouble is the shortage of coke at the blast furnaces. On the other hand, coke works all over the country are running on short time for want of the movement of coke from the yards. This state of affairs has existed for some time and is rapidly growing worse.

None of the coke works in the Connellsville and South Connellsville coke region are running to their full capacity; in fact the rule is but five days per week, and competent observers estimate the present output at 10 per cent. below the normal capacity. At this time there are large stocks of coke piled up on the coke yards; in many cases the coke yards are so blocked up with stock coke that the operations often have to be partially or fully suspended if cars are not placed to take the day's output. Various estimates have been made as to the amount of coke stocked at the plants of the Connellsville and South Connellsville coke region. Some place it as high as 1,000,000 tons, others as low as 200,000 tons. The first estimate is absurdly high and the latter is much too low. The probability is that 300,000 tons would be nearer the mark. The same conditions exist at all the other coke producing centers of the country. Considering the facts given, it is evident that there is no serious shortage in the article of coke itself and this will be demonstrated in another portion of this article.

Individual cars owned by coke manufacturers that in ordinary times have made the round trip between the ovens and the furnaces in five days are often 20 days out. This condition means a heavy loss to both the producer and consumer and to the country at large; it means losses in business aggregating to millions per month and to the wage earner actual suffering in these days of high prices for fuel and food. It further means that the balance of trade, instead of being with the States, is actually turning against us and we are again

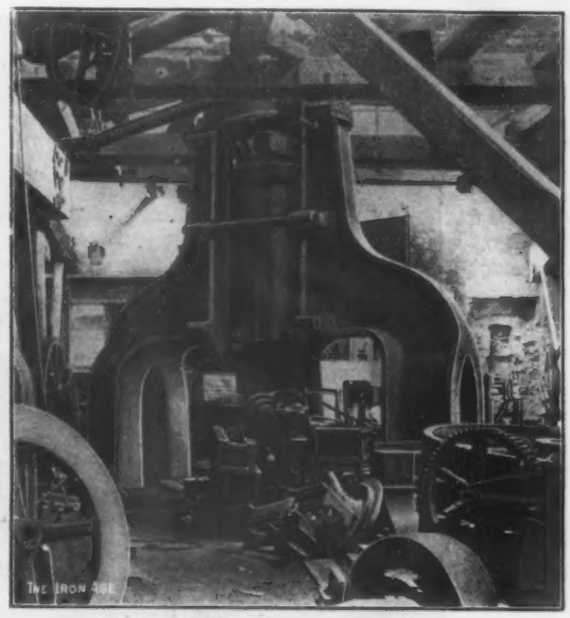

Fig. 14.—Steam Hammer in Forge Shop, 1868.

Fig. 13.—Large Pulley Lathe.

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rapidly becoming importers instead of exporters. Gold flowing out and steel flowing in is a condition that well may arouse the gravest fears for our immediate future prosperity.

Such is the situation at a time of the year when the weather conditions have been of the most propitious character. What it will be when winter closes in upon us is not hard to foresee; it will certainly be worse in-

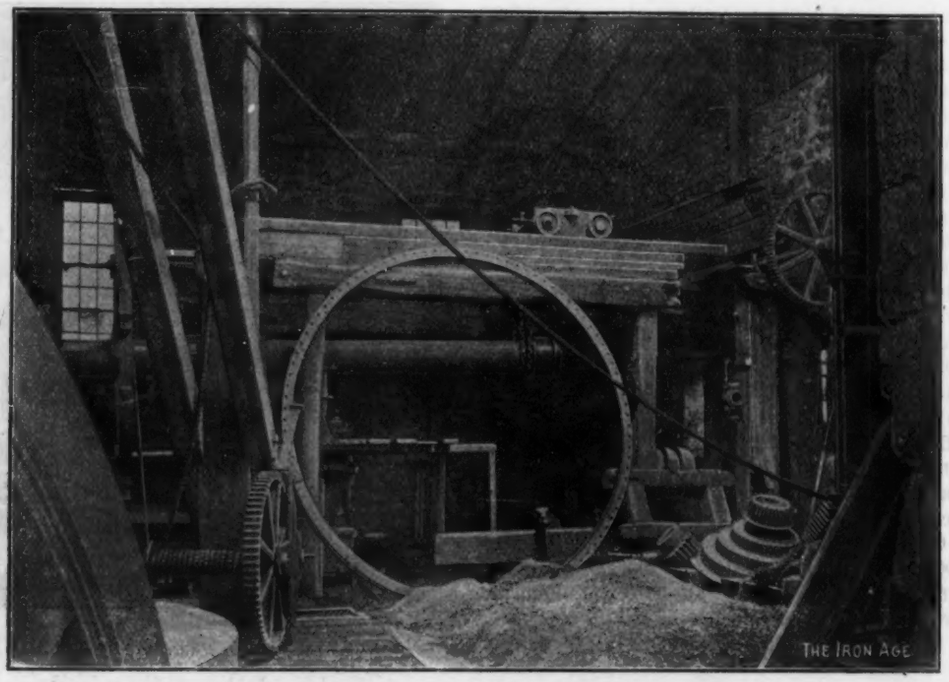

Fig. 15.—The First Traveling Crane in Existence.

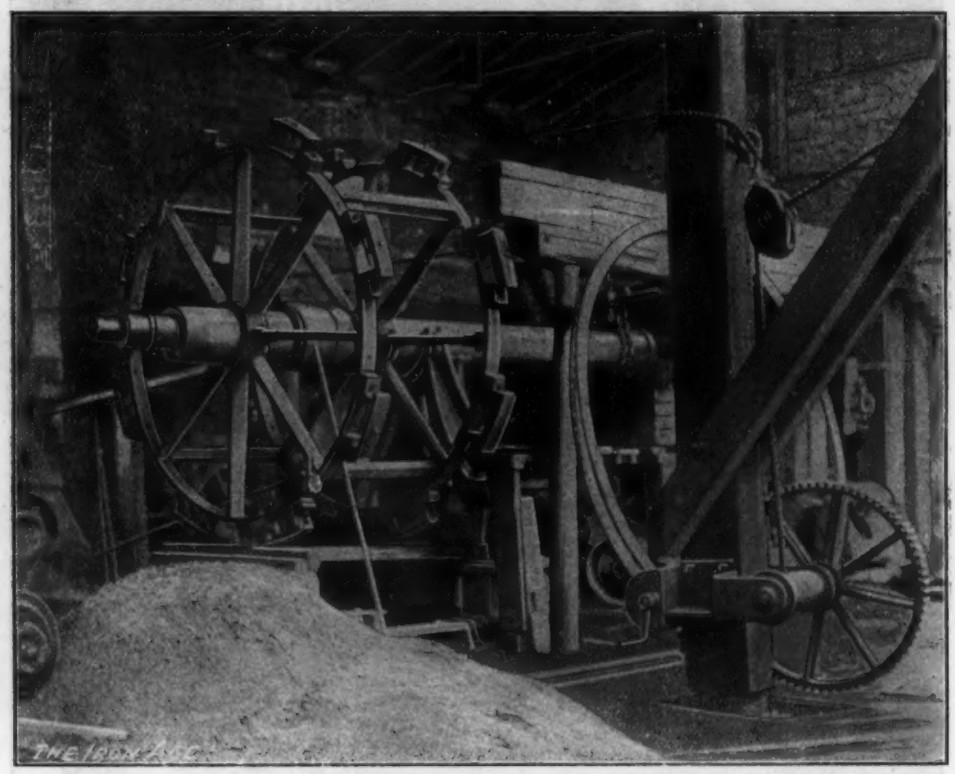

Fig. 16.—Cylinder Boring Mill with Which the Traveling Crane, Fig. 15, is Used.

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The Question of Transportation.

Locally the situation is most alarming and Pittsburgh, great as she is, trembles—and well she may—because her supremacy in steel is hanging in the balance, as the railroads converging and diverging at that point have confessed their inability to cope adequately with the congestion that naturally concentrates there.

stead of better, and the shortage of coke at the furnaces this winter will in all probability be the greatest ever known.

Naturally there has been a great outcry against the railroad management, and the railroad officials have in self defense given numerous reasons for their inability to cope with the situation. First it was lack of cars;

cars have been ordered built and delivered in the past two years by the tens of thousands. Next it was lack of motive power; locomotives have been ordered, borrowed from other sections, and built by the hundreds. Lastly it was the lack of siding room and terminal facilities; hundreds of miles of sidings have been built and terminal facilities improved on every hand. Railroad officials have been decapitated or removed by the score and wholesale changes have been made in the boards of management, yet to-day the coke regions are facing the greatest congestion of the year. It would seem that the difficulties that the railroad managements are now contending with have become chronic and that the remedy will be a question of time rather than a matter of heroic and spasmodic efforts, such as have been resorted to in the last few weeks.

There are some features of the situation that are exceedingly difficult to understand. It is a fact that for every ton of coke consumed for iron smelting at least 3 tons of other raw materials are required at the furnaces, yet there appears to have been no special shortage in the deliveries of iron ore, limestone, &c. In the item of ore, on an average about 2 tons are required for every ton of coke used at the furnaces. This ore is brought a distance many times exceeding the distance that the coke is hauled. It is carried by rail to the lakes, where it is loaded upon the boats and taken long distances by water, and there unloaded on the railroad cars, then taken a distance fully as great as the average coke haul; moreover, the bulk of this ore has to be hauled between April 1 and November 1, which is only at the very most seven months. Coke is loaded and unloaded but once as against three times in the case of ore, and is shipped the whole year round, with a short haul compared with that of the ore. Now if the transportation agencies succeed in handling the ore, which is really a complicated problem, why should they fail down when it comes to coke, which is a comparatively simple proposition?

One more remark and then this matter of transportation will be dropped. May not the difficulties that the railroad managements are confronted with to-day be in a great degree due to the fact that the railroad employees have been worked to the very utmost extent of their endurance for two years or more and that the supply of new timber, material, talent, or whatever it may be termed, is not only not equal to the requirements of the situation and conditions, but inadequate to keep up the *personnel* and efficiency of the executive and working forces? If this latter surmise proves to be correct then all the great improvements and betterments will be but one step as it were to the desired end. This country is facing this problem in every line of business to-day, the only solution to which is the establishment of special training schools, &c., all over the land. It is said that the railroads centering at Pittsburgh are handling less freight than a year ago.

Fig. 17.—General View of New Foundry.

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Statistics of Coke.

The article of coke is the vital element that actuates the metamorphosis of iron ore into steel, therefore its manufacture is a matter of supreme interest at this time. It is said that the world's production of coal, which is the mother of coke as it were, has increased 4500 per cent. in 75 years. From a statistical view point coke was not a factor worth noticing 23 years ago in the United States, for no reliable statistics are to be found prior to 1880. It seems that the coke industry had gained a somewhat precarious foothold as early as 1850. According to the census returns of that year there were four establishments employing 14 men having a capital of $3700, paying $3444 in wages, using materials, including coal, to the value of $6038 and producing coke to the value of $15,250. The price that the coke brought cannot be ascertained, but it would certainly be worth at least $2 a ton. Taking this as basis, the production of coke would be in round numbers 7500 tons for the year 1850.

The total production of coke in the United States for

the year 1901 was 21,795,833 tons, thus showing that the production of coke in the United States for 53 years has increased about 2900 per cent., which is at the rate of 55 per cent. per annum.

The production of coke in the United States from 1896 to 1902 is as follows—viz.:

	Net tons.		Net tons.
1896	11,788,733	1899	19,668,569
1897	13,288,984	1900	20,533,348
1898	16,047.209	1901	21,795,833

The rate of increase in production for the past six years in round numbers is about 16 per cent. per annum. It is impossible to get the statistics for the year 1902, as it is too early for their return, but the writer has reasons for thinking that the production of coke for the year 1902 will in all probability be about 23,000,000 tons, the major portion, or about 96 per cent. of which will be the product of the bee hive oven.

The great coke producing States for 190. were as follows—viz.:

	Net tons.
Pennsylvania	14,355,917
West Virginia	2,283,700
Alabama	2,148 911
Virginia	907,130
Colorado	671,303
Tennessee	404,017
	20,770,978
Other States and Territories	1,024,905
Total	21,975,883

The coke production of Pennsylvania for 1901 by districts, as given by E. W. Parker, U. S. Statistician, in "The Manufacture of Coke in 1901," is as follows—viz.:

	Net tons.
Connellsville	10,235,943
Lower Connellsville	1,116,379
Pittsburgh	813,478
Reynoldsville Walston	589,577
Upper Connellsville	569,511
Allegheny Mountain	548,076
Greensburg	257,785
Broad Top	118,949
Clearfield-Center	86,242
Irwin	19,977
Total	14,355,917

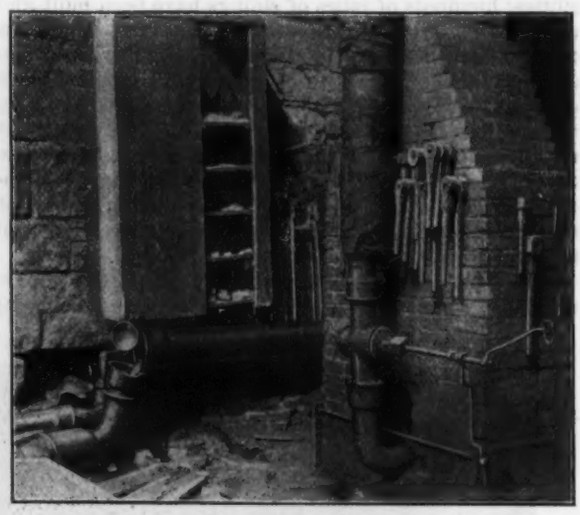

Fig. 19.—One of the "Cold Springs" Supplying the Foundry with Drinking Water.

Fig. 18.—New Drying Ovens.

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In the year 1901 six States produced 20,770,978 tons of the 21,795,883 tons of coke produced in the United States. The rates of percentages would be Pennsylvania, 66 per cent.; West Virginia, 10½ per cent.; Alabama, 10 per cent.; Virginia, 4 per cent.; Colorado, 3 per cent.; Tennessee, 2 per cent.; other States and Territories, 4½ per cent. From this it is to be readily seen that Pennsylvania produces two-thirds of the coke made in the United States and six times as much as her next competitor, which is West Virginia.

The rates of percentages for the above districts would be Connellsville, 71 per cent.; Lower Connellsville, 8 per cent.; Pittsburgh, 5½ per cent.; Reynoldsville Walston, 4 per cent.; Upper Connellsville, 4 per cent.; Allegheny Mountain, 4 per cent.; Greensburg, 2 per cent.; Broad Top, 1 per cent.; Clearfield-Center, ½ per cent.; Irwin, +. There are seven important coke making districts in the State of Pennsylvania, but the two great districts are the Connellsville with 71 per cent. and the Lower Connellsville with 8 per cent. of the State's output.

The writer estimates the output of the Connellsville district for 1902 at 13,000,000 tons. The writer further estimates the output of the Lower Connellsville district for 1902 at 2,100,000 tons.

The Requirements for Pig Iron.

Coke making and the making of pig iron are twin industries, as it were, and an article on "The Coke Industry" would be worthless without due reference to the statistics of pig iron production. For the year 1901 the pig iron production of the United States was 15,878,354 long tons. This includes pig iron made with anthracite coal, charcoal and coke and bituminous coal and charcoal and coke mixtures. The coke production for the year 1901 was 21,775,883 tons. It takes on an average about 1 ton of coke to the ton of pig iron, leaving about 6,000,000 tons of coke in excess of the pig iron requirements; therefore it is evident that in 1901 there was no real scarcity of coke, so far as relates to the production, and that is what we really have to consider from a coke viewpoint. The maximum capacity of the pig iron plants of the United States for 1902 is 350,000 tons per week, but the highest actual output in one week was 343,250 tons. Taking the average output at 320,000 tons per week the year's output would be 16,640,000 tons.

The writer estimates the production of coke in the United States for 1902 at 23,000,000 tons, leaving a margin of 7,640,000 tons of coke production above the consumption of the pig iron industry, again demonstrating the fact that there was no actual scarcity of coke in the present year—a year when the coke plants are running fully 10 per cent. below their capacity.

Future Requirements and Supply.

The estimated new pig iron production for the year 1903 based upon the fact that there are 25 new furnaces under construction (in the United States) is at a fair estimate 2,500,000 tons, which of course may be added to the blast furnace capacity of 1902. This thus added to the maximum capacity in 1902 (350,000 tons per week) would make the very highest production possible for 1903 21,700,000 tons. To the estimated coke production of 1902 (23,000,000 tons) we may add 10 per cent., or 2,300,000, making the coke producing capacity of the present coke plants 25,300,000 tons. However, there is another fact to consider that will greatly augment the production—*i. e.*, there are 15,000 bee hive coke ovens building in the United States with at least 600 tons per oven per annum capacity, or 9,000,000 tons of coke, not to mention several thousand ovens projected for 1903 in different sections of the States, many of which will be completed during the year. It is further claimed that the by-product oven capacity will be increased by 3,000,000 tons during 1903, making a grand total of 37,300,000 tons of coke capacity for the year 1903, and this will mean an excess of 15,600,000 tons of coke capacity over the blast furnace requirements of the United States, thus demonstrating that there will be no real scarcity of coke for the year 1903. The whole difficulty has been for two years, is now, and seems likely to be next year, a matter of transportation alone.

For the year ending December 31, 1901, there were in the United States 64,001 coke ovens and 5153 building. The total amount of coal used was 34,207,965, and the percentage of yield was 63.7 per cent. The total value of coke, $44,445,923, and the average price $2.039.

The by-product coke industry is becoming a factor in the coke production of the United States. In 1893 there were 12 by-product ovens built with a production of 12,800 tons. In 1901 there were 1165 by-product ovens built with a production of 1,179,900 tons. At this time there are 3413 by-product ovens building in the United States and Canada.

The relative proportions of bee hive and by-product coke of the United States, England and Germany for 1901 was as follows—viz.:

	Bee Hive coke. Per cent.	By-product coke. Per cent.
United States	95	5
Germany	60	40
England	80	20

This shows a production of by-product coke directly in ratio to the quality of the coals of the respective countries.

In all probability there will be a rapid increase in the production on by-product lines in the next few years, as it takes in a class of coals that are not readily coked in the bee hive. It is estimated that the by-product production will be about 13 per cent. of the total production in the United States for 1903.

Up to November 21 of 1902 the coke shipments from the Connellsville and South Connellsville regions were as follows, the shipments for 1901 being appended:

	To November 21, 1902. Cars.	Year, 1901. Cars.
Pittsburgh points	159,674	160,773
Western points	270,422	246,738
Eastern points	80,206	98,000

This shows a marked decrease in shipments East, a slight decrease to Pittsburgh points and a large increase to Western points. An increase may be expected in all the other coke making districts for 1902, and this is included in the total estimated productions of 23,000,000 tons for 1902.

The average price of coke for 1902 will be well on to $2.50 per ton. In the past few months the price for furnace coke, outside of the regular contracts, has ranged from $3 to $4 per ton, and for foundry and other coke in orders from one to 100 car lots, the price has ranged from $7 to $14 per ton. Contracts for furnace coke for the first six months of 1903 have been made at prices ranging from $3 to $4 per ton. These prices cannot be sustained for the whole year, and the outlook is decidedly more favorable to the furnace interests than the coke interests, if transportation can be provided.

Freak Oil Well in Kentucky.

There is an old oil well near Payne Creek, 6 miles from Barboursville, Ky., which is a puzzle to the oil men of the country. The well, which is now in the middle of the creek, flows regularly every November, but never at any other time of the year. During this month it flows at intervals, discharging great streams of oil, gas and salt water, and suddenly stops to flow no more until November comes around again. This strange well was drilled in 1840, on the bank near Payne Creek, by old settlers, who were after salt water, from which to obtain their salt. The machinery used at that date was of the crudest nature, yet the drillers succeeded in getting down 450 feet, when, to their astonishment and dismay, they struck an immense stream of oil, which flowed for days and weeks. In the course of time the bed of the creek changed, until, at this day, it flows over the top of the old well. Since then during every November the water over and around the hole boils up through the force of escaping gas. As far back as the people in the neighborhood can recollect the well has made these annual eruptions. This year the disturbances came somewhat earlier than usual, attracting more than ordinary attention, owing, doubtless, to the fact that oil men are operating in that section of the country. At times during the last few days water and oil have been thrown up fully 50 feet.

Standard Oil Company's directors have declared a quarterly dividend of 10 per cent., or $10,000,000, making a yearly dividend distribution of $45,000,000 on the capital of $100,000,000. This compares with $48,000,000 in each of the last two years, $33,000,000 in 1899, $30,000,000 in 1898, $33,000,000 in 1897, $31,000,000 in 1896 and $12,000,000 in each year from 1895 to 1891, inclusive. This dividend declaration makes the total distribution in ten years equal to 328 per cent., or $328,000,000 on a capital stock of $100,000,000.

The Duquesne Works of the Carnegie Steel Company.—I.

The Open Hearth Plant and the Blooming and 14-inch Morgan Continuous Mills.

In order to enable the Carnegie Steel Company to supply the constantly growing demand for basic open hearth steel in the form of slabs, blooms and billets of all sizes this company decided in the fall of the year 1899 to erect an open hearth plant and blooming mill at Duquesne. The open hearth steel was also to be used for the production of rounds and flats in the new merchant bar mills, as well as for other products for several contemplated finishing mills.

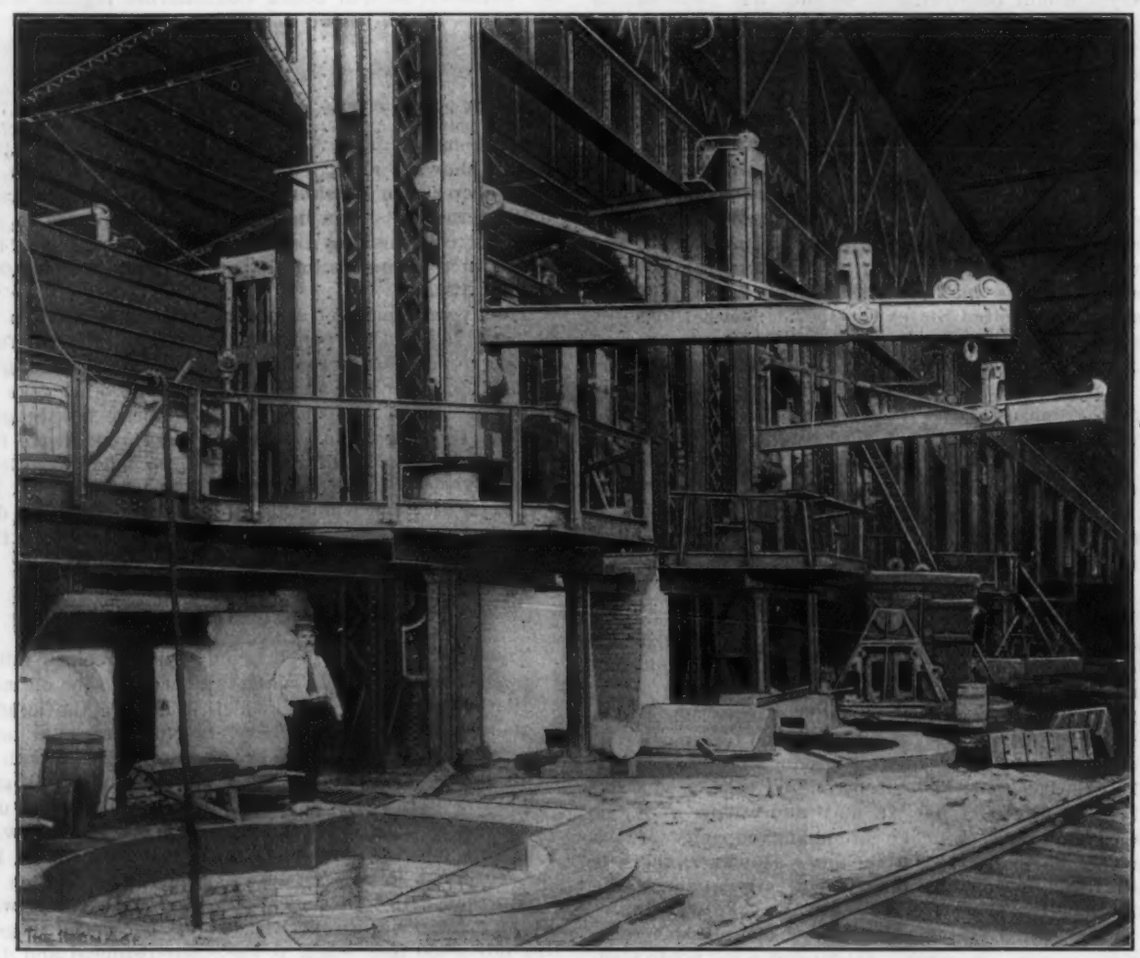


Fig. 2.—View of Rear of Open Hearth Furnaces.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

Open Hearth Plant.

The stationary type of furnace of 50 tons capacity was selected as being most suitable for the requirements and very economical in operation. Twelve of these furnaces were erected in one line and two more have been added, making 14 in all in one building 128 feet 3 inches wide and 957 feet long. The plan, Fig. 1, shows the general arrangement.

The stock yard, 62 feet 1 inch wide and 924 feet long, adjoining the furnace building, contains two standard gauge and three narrow gauge tracks, and is spanned by four 5-ton electric traveling cranes. These cranes handle the raw material placed in charging boxes, depositing the filled boxes on cars, which are weighed on track scales and delivered by locomotive to a track in front of the furnaces. Three Wellman-Seaver charging machines traveling on tracks along the full length of building then deposit the charges on the furnace bottoms.

The charging floor, being the floor of the furnace building, is 75 feet wide and 957 feet long. It is provided at one end with two track inlets for hot metal cars from the blast furnaces and is spanned by a 40-ton overhead electric traveling crane for handling the hot metal ladles from these cars to any one of the 14 furnaces requiring such a charge. The main hoist of this crane is provided with hooks to fit the trunnions on the ladles. The hoisting is done from a two-drum trolley, with its hoisting chains outside of the girders. The 15-ton auxiliary hoist is placed in a separate trolley between the girders and is used for tipping the ladles when charging the furnaces with molten iron, as well as for facilitating the usual repairs around the furnaces.

The floor of the pouring building is 53 feet 3 inches wide and 957 feet long. It is 9 feet lower than the charging floor and contains the ladle pits and repair pits, three narrow gauge tracks, which extend the full length of building, with suitable cross-overs, four pouring platforms with their car pushers and three 75-ton overhead electric traveling cranes, as well as small hydraulic cranes, one for each furnace, for handling spouts, bridges, &c.

The ladle pits are very shallow, being only 3 feet 9 inches deep, thereby greatly facilitating the work of removing the hot cinder and of cleaning the pits. The cinder is loaded on cars on the track nearest to the furnaces. The middle track is the running track and the outside track is the pouring track, along which the four pouring platforms are located. Underneath each platform is located the car pusher for moving the cars to the proper location for pouring. The pusher is hydraulic and is operated from the platform.

Three 75-ton electric traveling cranes are provided for hoisting and transporting the filled steel ladles from the furnaces to any one of the pouring locations and for

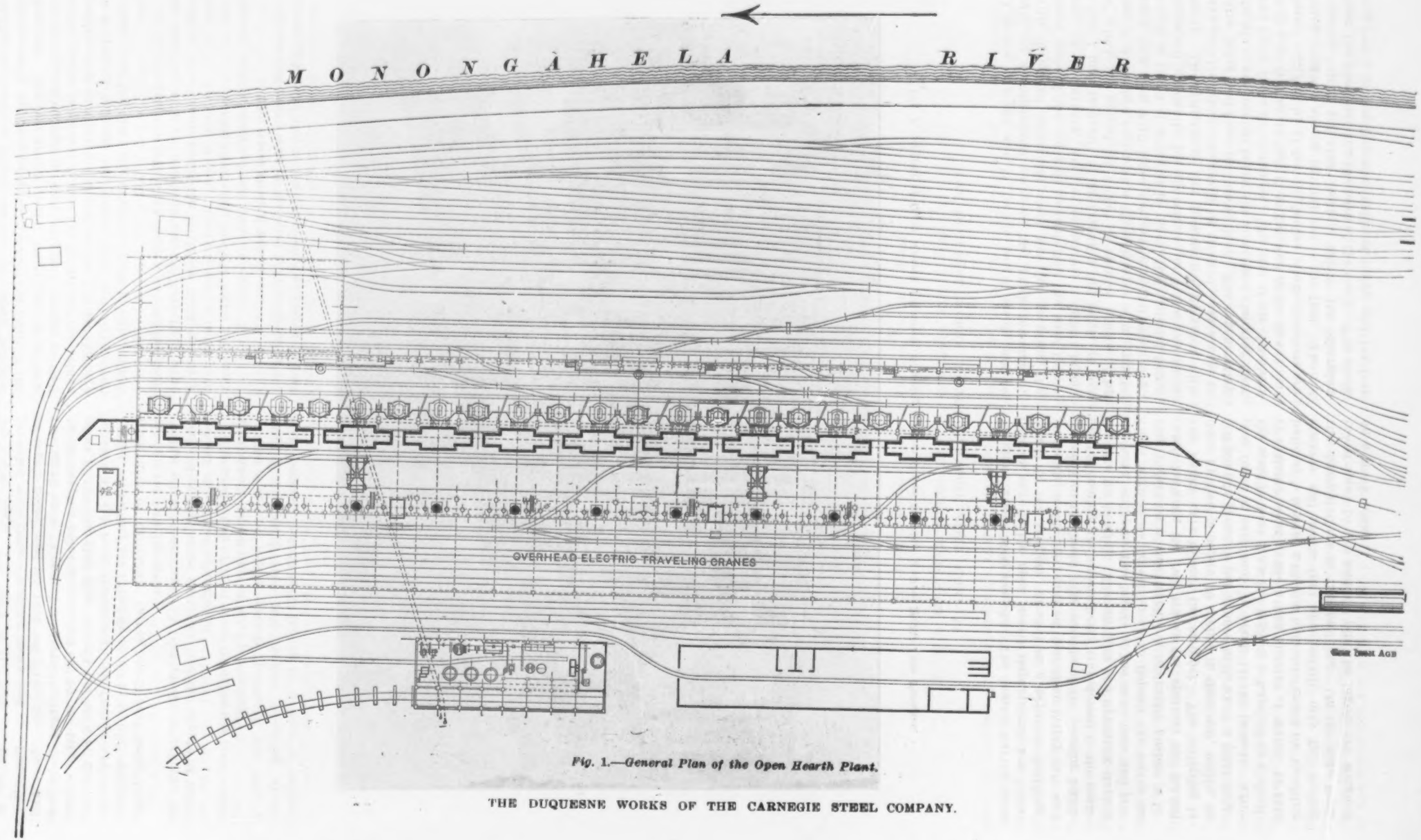


Fig. 1.—General Plan of the Open Hearth Plant.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

placing the ladles in the stands over the repair pits and subsequently on stools over the ladle pits in front of the furnaces. The two drums of the 75-ton main hoist trolley are spread enough to allow the hoist chains as well as the guides to pass down on the outside of the bridge girders so as to allow the 25-ton auxiliary hoist carriage to be placed between the girders and travel their full length, enabling this hoist to tip the ladle in either direction.

A skull cracker structure is provided outside the pouring building with an overhead electric traveling crane with a 25-ton main and 5-ton auxiliary hoist, giving a drop hight of about 50 feet. There is also a mold yard with a 5-ton overhead traveling electric crane for handling and placing molds, stools, &c., on cars.

The Open Hearth Furnaces.

Front and rear views of the open hearth furnaces are shown in Figs. 2 and 3. Each furnace measures 13 feet 3½ inches high. The front of the furnace proper is provided with three charging doors and two inspection or repair doors, and the back with two large doors and two small ones. Convenient access to these doors and to the tapping holes is provided for by the large extensions to the charging floor around the back of the furnaces. All the large doors and door frames are water cooled. All doors are lifted by small hydraulic cylinders from nest of Critchlow valves, each nest being large enough for two furnaces.

The plant is arranged so that producer gas can be adopted at very short notice in case the supply of natural gas should not be sufficient.

The production of 12 of these furnaces has been somewhat above 40,000 tons of steel per month.

The sizes of ingots usually produced are 18½ x 21½ inches by 5 feet 10¼ inches, weighing about 6000 pounds, and 22 x 25 inches by 5 feet 5 inches,

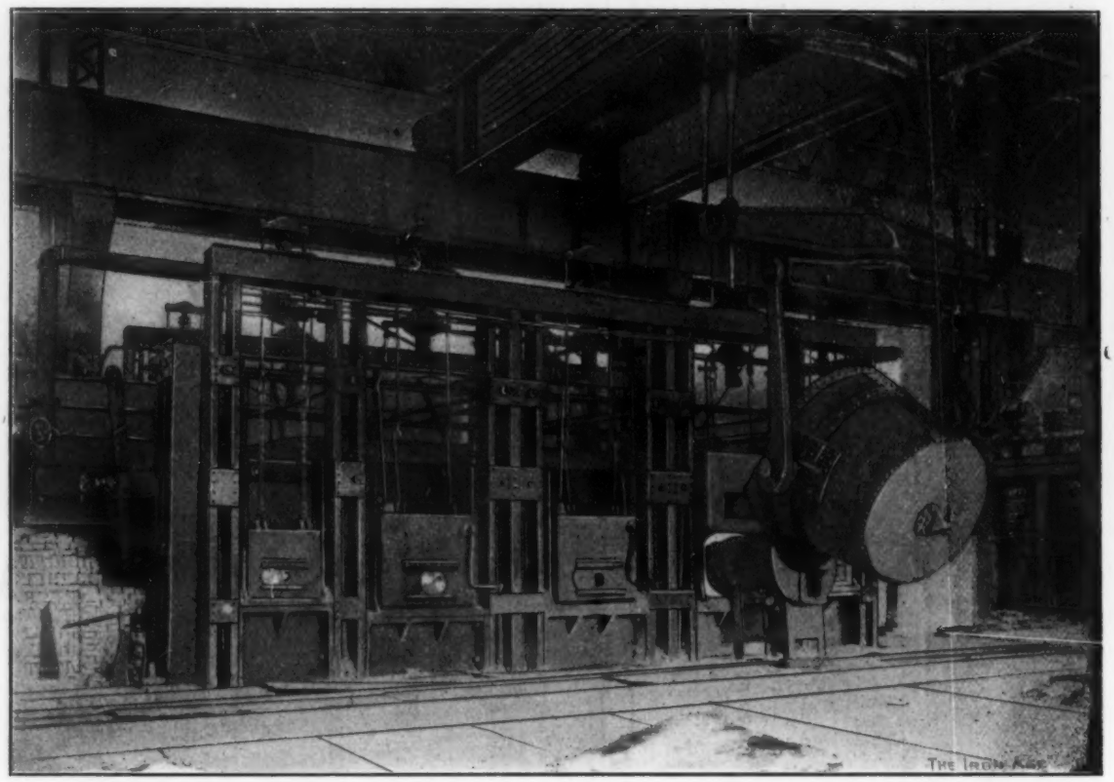


Fig. 3.—Front of Open Hearth Furnaces, Showing 40-Ton Crane Pouring Molten Metal Into Furnace.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

11 inches in width and 27 feet in length inside, and is built on a substantial concrete and brick foundation, with imbedded structural steel ties for securing the lower ends of the uprights constituting the steel frame work of the furnace. On the foundation is built a layer, 2 feet 1 inch in depth, of first quality fire brick, on top of which are placed 4½ inches of chrome bricks. The hearth is finished first with a 4½-inch layer of magnesite brick and then with loose magnesite mixed with slag, which is fused or sintered in place, the material being deposited gradually by shovelfuls until the hearth is ready. The bottoms of the uptakes are provided with slag pockets which can easily be cleaned, easy access to same being had from the lower floor. The regenerating chambers are located below the structural charging floor and away from the furnaces. The size of air chambers is 10 x 22 feet by 11 feet 11 inches and of the gas chambers 6 x 22 feet by 11 feet 3½ inches. Both chambers are being used for air, as natural gas is the fuel. The reversing valves are also located below the charging floor, the flues entering the base of the stack. The stack is 5 feet 2 inches diameter inside of lining and 144 feet weighing about 8000 pounds. The ingots, having been cast on cars in the open hearth department, are transferred to the stripper, located in a separate building, where the molds are removed, placed on empty cars and returned to the mold yard outside of the pouring building for cooling, the ingots being transferred to the soaking pits for heating. The stripper is a hydraulic duplex machine, stripping two ingots at the same time and provided with cross travel so as to deposit the molds on empty cars on a side track. A hydraulic pusher is located between the two tracks for spotting the loaded and empty cars to suit the stripper. The stripping is done by two plungers 19 inches in diameter, which, at 500 pounds pressure per square inch, exert a total stripping force on each mold of about 141,000 pounds. After the mold is loose from the ingot it is handled by a smaller cylinder so as to use a less amount of water. In this building is located a 6½-ton hydraulic crane for handling stickers and molds that accidentally may fall during the manipulations in this building. On the road from the stripper to the soaking pits the ingots are weighed on a track scale.

The Soaking Pits.

The location of the 40-inch blooming mill in reference to the other plant was selected so as to enable the mill to draw its supply of heated ingots from any one of the pit furnaces, derive its steam supply from a centrally located boiler house and at the same time have its own outlet for the finished product, so as not to interfere with the shipping department of the other mills. The location is shown in Fig. 5.

To accomplish this aim nine new pit furnaces were built, each one in a right angular direction from the former ones. The plan was to use five of these pits for the old mill and four for the new blooming mill. Track inlets were provided between every two furnaces for the incoming ingots, so that the charging crane can place the steel into the pits without handling the ingots above any other pit, or over any cover or machinery for operating the same. A structural floor supported independently covers all the regenerative chambers, which floor supports the covers and their hydraulic operating mechanism. Wherever there is any likelihood that ingots may drop this floor is strengthened with a layer of rails placed side by side. Outside the ends of the pit furnaces is placed the pot car track, over which the heated ingots are transferred by means of the electrically driven pot cars to either mill. The building covering the pit furnaces has a span or main building of 56 feet 6 inches and of the lean-to covering the reversing valves 18 feet 7 inches. The total length of the building is 285 feet.

The main building is provided with roadways for the four vertical charging machines for the pit furnaces. The machines are of 6-ton capacity and have a lift of 15 feet. These machines were the first ones built that had the gripping action of the tongs as well as all the other movements performed by electric motors. Along one side of the building is a platform for the convenience of the operating men, as well as for aiding the men in making the usual repairs on the charging cranes. On the other side of the building and underneath the lean-to roof are suspended two platforms, where are located all the hydraulic valves for operating the pit covers as well as the controllers for operating the pot cars. Each pit furnace contains four pits 5 feet 3 inches square, each one large enough to hold four ingots. Each group of two pits has its own reversing valve and damper. The fuel is natural gas. The pits are lined at the slag line with chrome or magnesite brick to resist the cutting action of the slag, and the under side of the bottom is provided with ample air cooling surface to preserve the bottoms. The whole furnace is well tied by corner binders and rods and occupies a width of 29 feet 1 inch outside of the brick work and a hight of 21 feet 2 inches from cellar floor to top of pits. The stack is 3 feet 8 inches diameter inside of lining and 103 feet 8 inches high.

The 40-Inch Blooming Mill.

The mill which is shown in Fig. 4 is a reversing mill of very massive construction, the housings weighing about 90,000 pounds each. The rolls are steel castings and long enough to allow five passes, differing in widths from 22 to 4⅜ inches, and suitable to roll any section from 22 x 2 inch slab to 4 x 4 inch billet. The diameter of the body of roll when new is 29½ inches and the diameter of neck is 22 inches. The screws for adjusting the top roll are operated by hydraulic cylinder and gearing, the roll being counterbalanced by levers and weights. The window of the housing is wide enough to allow changing of rolls through this window. The front and rear mill tables are of exceptionally heavy construction, the rollers being 16 inches in diameter and 7 feet 1 inch long between journals, while the journals are 6 inches diameter and 15 inches long. The journal bearing caps are secured in place by only two bolts each, to facilitate repairs. The sections of the table beams nearest to the mill are steel castings to insure extra strength. The side guards on the front table, opposite the manipulator and extending to the mill end of the table, are made in sections of steel castings so as to enable them to withstand the blows from the ingots when these are turned by the manipulator. The lengths of the front and back tables from the center of the rolls are 55 feet 9 inches for each table. All the rollers in each table are driven by bevel gearing from line shafts directly connected to one 12 x 12 inch revers-

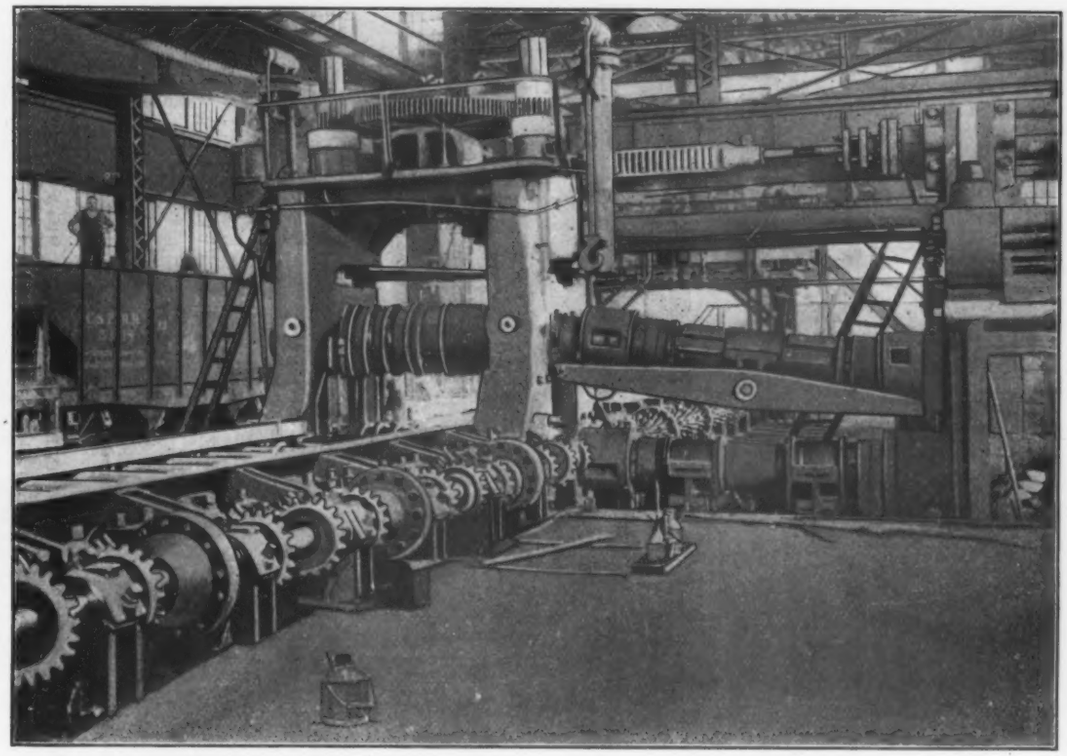


Fig. 4.—The 40-Inch Blooming Mill and Rear Mill Table.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

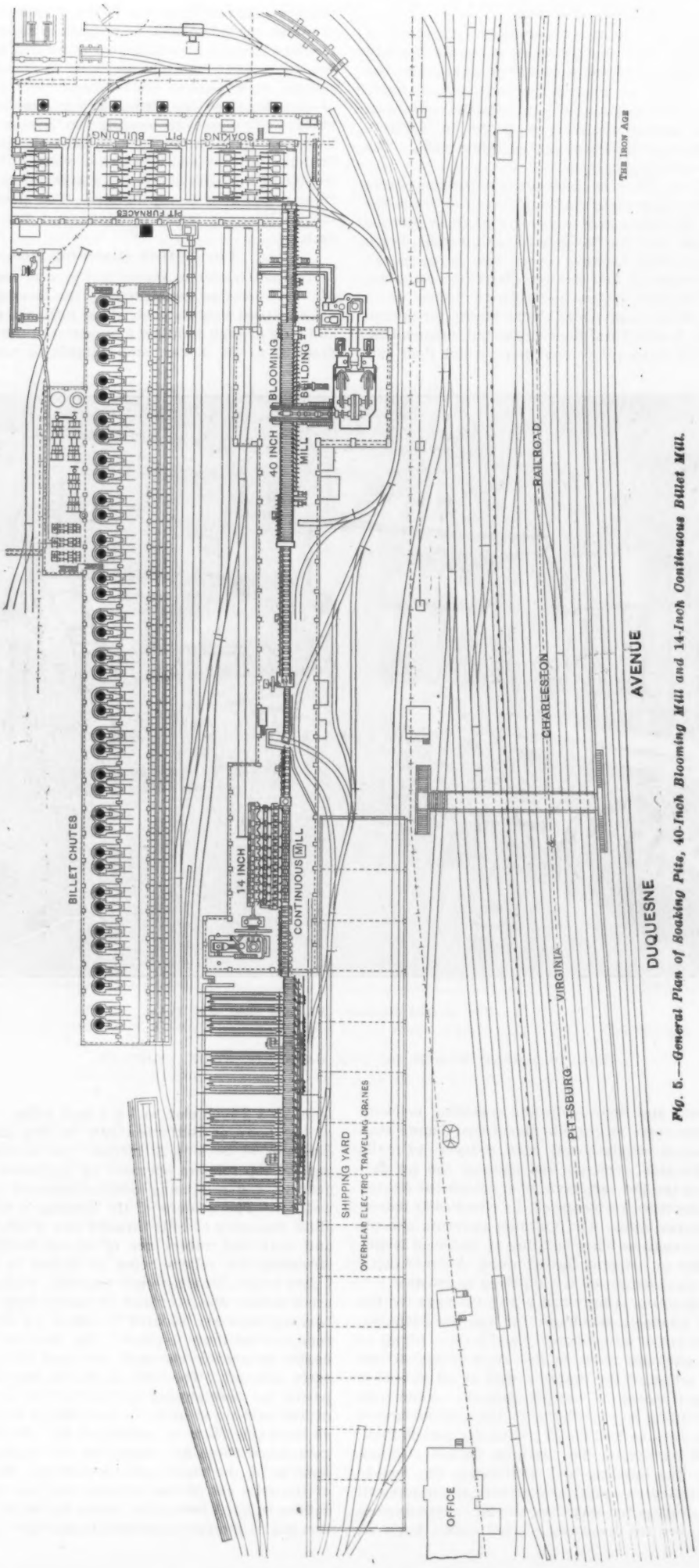


Fig. 5.—General Plan of Soaking Pits, 40-Inch Blooming Mill and 14-Inch Continuous Billet Mill.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

ing engine for each table. These line shafts also drive two rollers, each having their bearings in the roll housings on each side of the rolls, thereby avoiding the use of the customary dead plates nearest to the rolls. The rollers 12 inches in diameter, which are driven through miter gears by a geared 50 horse-power motor. This motor is controlled from either the roller pulpit or from the soaking pit building by means of a controller at

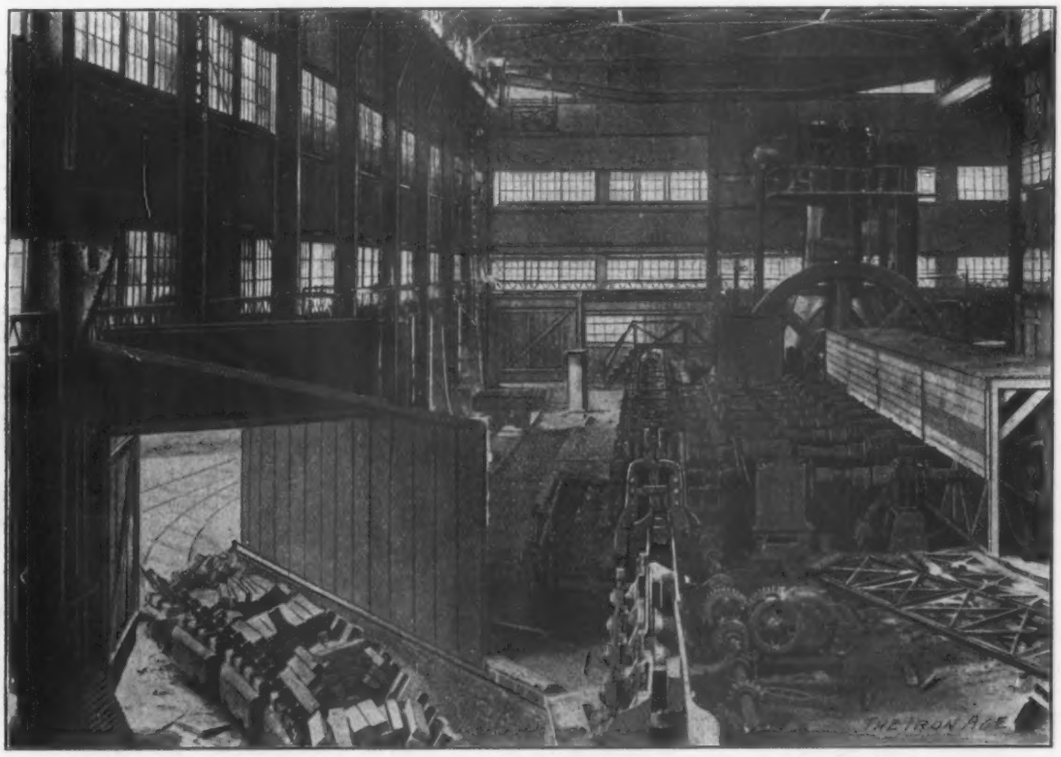


Fig. 6.—View of 14-Inch Continuous Mill.

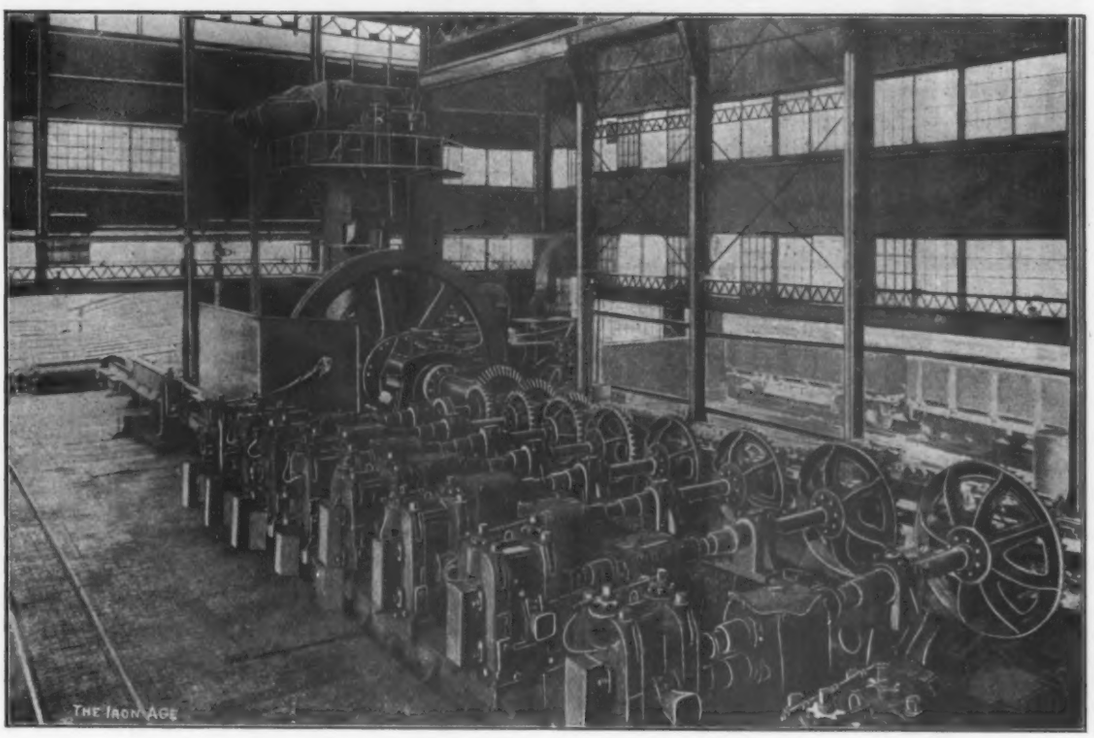


Fig. 7.—View of 14-Inch Continuous Mill and Engine, Looking Toward Entering End of Mill.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

approach table, extending from the soaking pits to the mill table, is 84 feet long and is made in two parallel halves, one half being the ingot run and the other half an idler table for supporting the ends of the nearly finished billet or slab shapes. The ingot run contains solid

each place, so as to enable the pot car boy to run the ingot up to the switch at the further end of the table while the roller is finishing the former ingot, after which the roller runs the ingot into the mill table. The manipulator motions, the adjustment of top roll and the re-

versing and controlling of the engines are all governed by operators on the roller's pulpit, which is located right above the mill table and about 42 feet from the rolls.

The engine is a 55 x 60 twin cylinder reversing engine, geared 1 to 1 to the jack shaft, which is coupled to the mill pinion. The engine is equipped with a steam reversing gear and piston valves. The pistons are carried by heavy piston rods supported by tail rod shoes outside of the cylinder heads. A hydraulic shear is placed in the table at a distance of 89 feet from the mill. This shear is intended for cropping ends of ingots that may split from being rolled, as well as being an emergency shear in case the regular shear should be disabled. Beyond this shear, and at a distance of 92 feet 10½ inches from it, is located the regular billet and slab shear for cutting blooms, billets and slabs to the required lengths. This shear is engine driven and capable of cutting all sections up to 8-inch thickness and 22-inch width. All the shear tables as well as the loading table are driven by electric motors, the main shear table by a 50 horse-power motor, the tilting table and the loading table each by a 19 horse-power motor.

The rear shear table is about 16 feet long and provided with rollers placed 12 inches center to center, so as to successfully convey short lengths. The table is a tipping table, having its fulcrum in the back, the front being raised or lowered by a hydraulic cylinder under control of the shearman. In its highest position this table is level and at the same elevation as the front shear table. This arrangement enables the operator to shear the last piece of each ingot to the greatest useful length by supporting the piece in the level position until the knife descends on the piece. The table is capable of making a sliding motion in a longitudinal motion under the control of the shearman. This feature enables the operator to provide an opening between end of table and shear knife large enough to drop the scrap into the scrap conveyor. A disappearing idle roller is also provided to fill the space between the loading table and the shear table when in its most forward location. This prevents short pieces from dropping down between the tables. The loading table, which forms a continuation of the rear shear table, is about 20 feet long. It is equipped with a steam pusher for skidding the product across the table and down an incline on cars. An adjustable and removable stop is also placed behind the pusher so as to stop any piece opposite the pusher that may have to be loaded on cars. The motors driving the rear shear table and the loading table are controlled by an operator on an elevated platform which affords him a clear view of all this machinery. This same operator manipulates also the removable stop over the latter end of the loading tables, the pusher for skidding the product off the table on the cars and the car pusher which spaces and shifts the cars in front of the loading chute on the table. The removable stop can be raised high enough to allow the ingot rolled out to a cross section of 4 x 6 inches to pass on to the 14-inch continuous mill, to be rolled out to billets from 4 inches square to any section down to 1½ inches square. All the shear tables and the loading table are spanned by a 15-ton overhead electric traveling crane, whose roadways are supported by the building columns so as to facilitate the ordinary repairs. This crane is also equipped with a 5-ton auxiliary hoist. Over the mill and engine is a 50-ton electric traveling crane, which is equipped with a 10-ton auxiliary hoist. At the end of the loading table is a track on which are stationed a couple of cars furnished with boxes for the removal of scrap ends that may be too long for the regular scrap conveyor or for taking care of all the scrap in case the conveyor should be out of repair.

Outside of the shear building is a stock and shipping yard, where the blooms, billets or slabs are cooled, inspected and loaded on cars ready for shipment. This yard is 60 feet 2 inches wide and 490 feet long, and has two 10-ton overhead traveling cranes for handling the material. These cranes are also equipped with auxiliary hoists of 2-tons capacity each. The general arrangement of the mill and its location are shown in Fig. 5.

The mill has proven very efficient and has made a

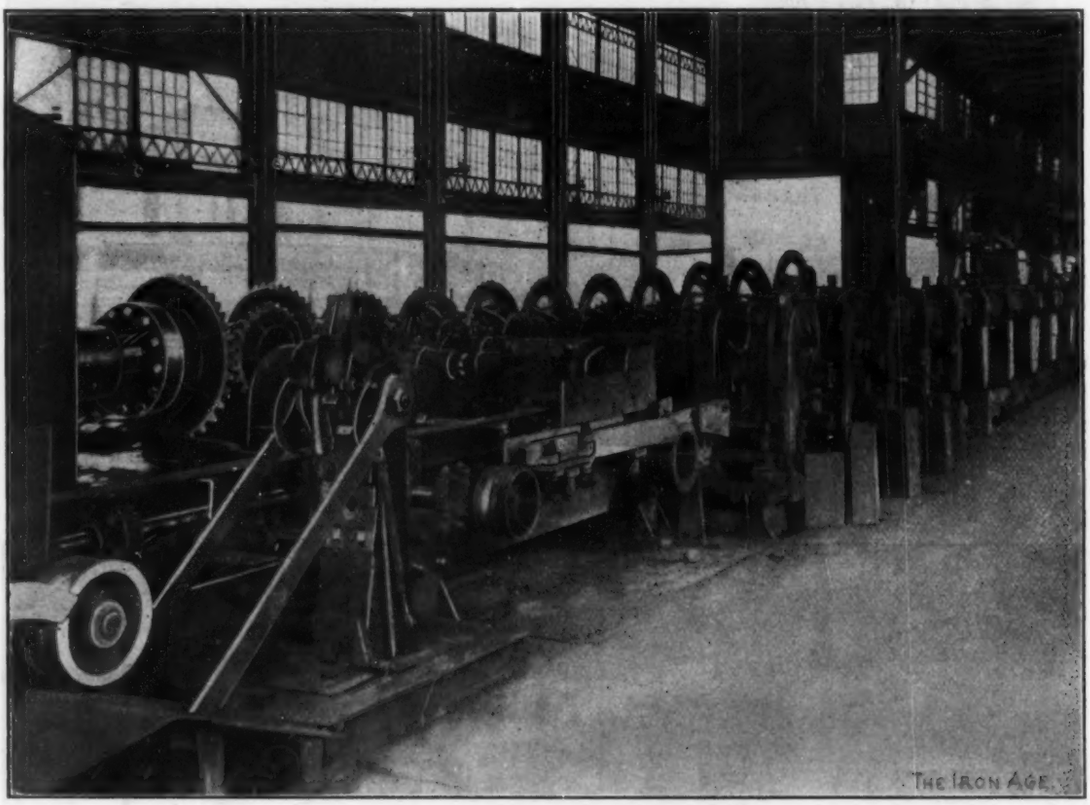


Fig. 8.—View of 14-Inch Continuous Mill and Flying Shear, Looking Toward Finishing End of Mill.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

monthly record of over 33,000 tons, of which about half was rolled to 4 x 6 inch sections or less.

The 14-inch Continuous Morgan Mill.

The new merchant mills of the Carnegie Company, which we shall describe in the next issue of *The Iron Age*, called for a supply of long billets. The old rail mill at Duquesne was fitted to roll 30-foot lengths of small billets, but could not dispose of the full tonnage of the mill. A Morgan continuous billet mill, together with a pair of Edwards flying shears, had been in service for some time to take care of the growing demand for small 30-foot billets. But these were all taken up. So a second continuous billet mill equipment was placed in connection with the new 40-inch blooming mill, its position with reference to the latter being shown in the general plan, Fig. 5.

Views of this continuous mill are shown in Fig. 6 and Fig. 7. Another view, including the flying shear, looking toward the finishing end of the mill is given in Fig. 8. Still another view, taken from the lower gallery of the engine, is presented in Fig. 9. The bevel gears driving the mill are clearly exhibited in Fig. 10. The hot beds and the pulpit for the mill are shown in Fig. 11, while Fig. 12 shows a general view of the hot beds and loading tracks for the 14-inch continuous mill and the crane structure over the shipping yard of the 40-inch blooming mill.

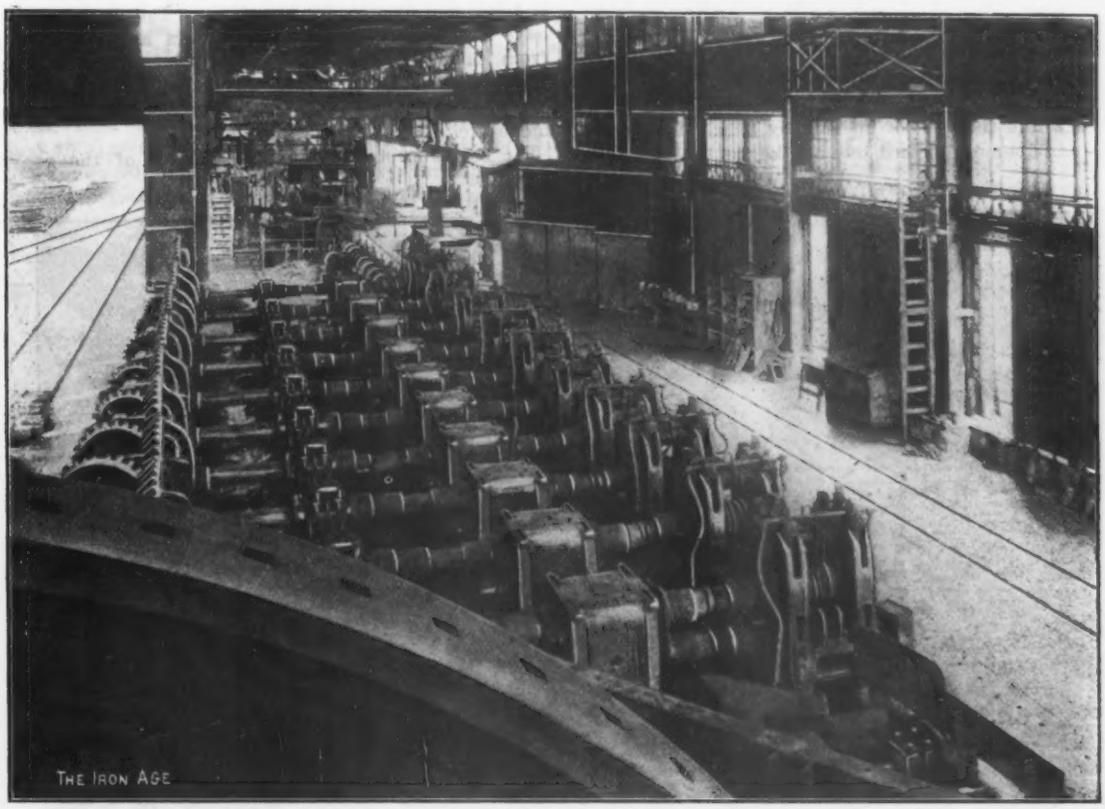


Fig. 9.—View of 14-Inch Continuous Mill from Lower Gallery of Engine.

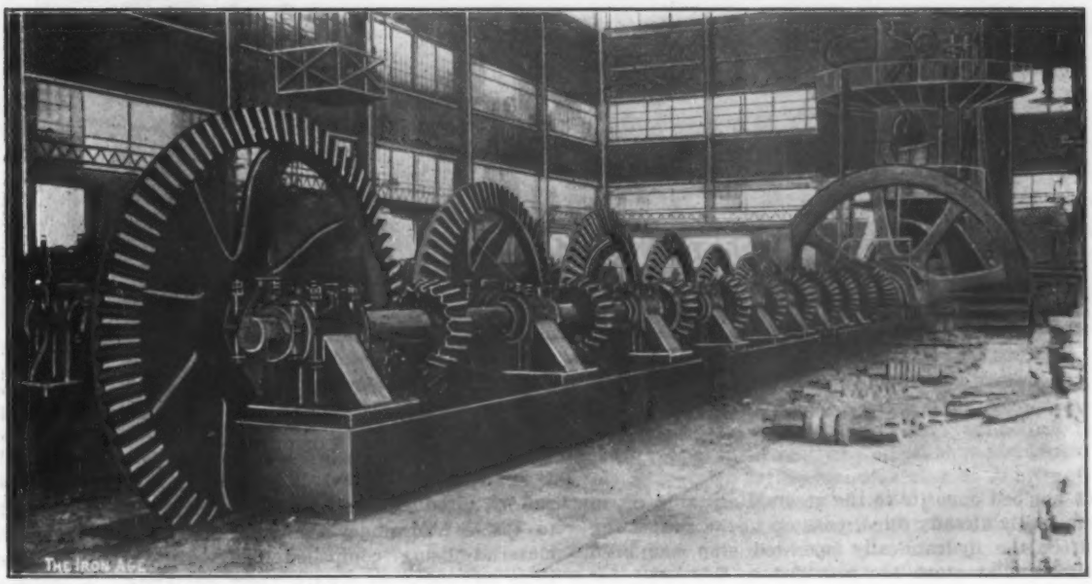


Fig. 10.—View of Bevel Gears Driving 14-Inch Continuous Mill.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

The Morgan continuous mill comprises 10 trains of 14-inch rolls driven by a 44 and 78 x 60 inch compound condensing engine, having one cylinder horizontal and one vertical. In this mill an entire ingot weighing 6000 or 8000 pounds, after being broken down to 4 x 6 inches, is received and rolled continuously to 3, 2½, 2, 1¾, or 1½ inches square, and cut to length automatically as it leaves the last pass with but one crop and one short for the entire ingot.

As the severed billets pass the trigger of the flying shear they are run out on a skew-roll assembling table, where the entire group of billets from one ingot automatically line themselves up side by side. The entire group can then be pushed out by the hot pull-up slide onto the hot bed opposite to the assembling table, or, in case this bed is already filled, pass on to the succeeding table after the hydraulically operated stop has been lowered. Similar stops are provided in this table for lining the billets up opposite any one of the three succeeding hot beds, onto which they can be mechanically pushed out for cooling. After billets are cool they are pushed off the bed, loading them on cars by the cold pull-ups that are provided for each bed.

The operation of all the machinery in these beds is performed by two men or boys, stationed in an elevated tower, affording them a clear view of all the beds. After the cars are loaded they are run down a slightly sloping track by gravity, allowing a new supply of empty cars to take their places. These hot beds have proven very satisfactory in handling all the material produced by this mill.

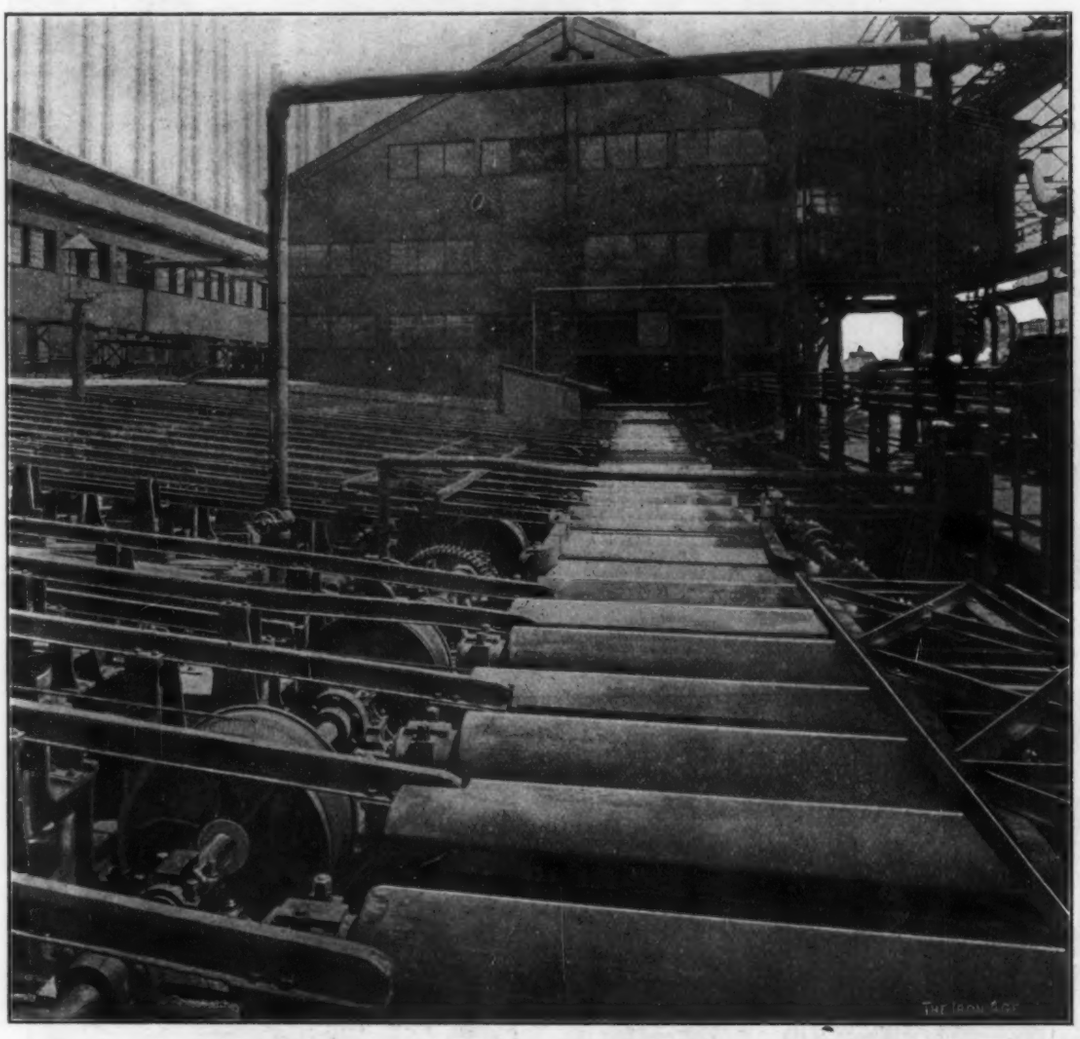


Fig. 11.—General View of Hot Beds and Pulpit for 14-Inch Continuous Mill.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

The Production and Treatment of Steel for Structures.

BY JAMES CHRISTIE, PENCOYD, PA.

No changes of material importance have developed during the past year in connection with the production or treatment of steel for structures. The manufacturers have all been so busy in filling orders and the pressure from customers has been so insistent that the opportunity to experiment has not been offered. Changes in methods are more apt to be secured when demand is moderate.

It seems probable that the quality of the general run of product has been somewhat lowered, owing to the extraordinary demand and the consumers of material being compelled to relax their specifications in order to obtain their demands. A decided movement has developed toward uniformity of specifications and grade of material. Singularly enough this has not originated with the manufacturers, whose interest would seem to lie in that direction, but has been largely initiated in technical associations that are not directly moved by manufacturers of steel. The recent discussions before the American Society for Testing Materials and the American Railway Engineering and Maintenance of Way Association indicate a strong sentiment in favor of the adoption of a single grade of steel for structural purposes.

As the standard material for ordinary work has a tendency to be confined within definite limits, it is prob-

able that the adoption of a uniform grade would only be representing specifically the facts of current practice. The prevailing drift of opinion seems to be favorable to a material ranging from 55,000 to 65,000 pounds tensile strength, and these limits in both directions embrace the metal that seems to be the natural product of the basic open hearth furnace, this being now the predominant metal. There is a question whether the upper and lower limits should be closer together than the range of 10,000 pounds. It is probable that such an extreme range would not be necessary for ordinary product, but it is nevertheless desirable to have the range wide enough to cover the respective physical qualities of thick and thin material and of the physical effects of rolling at comparatively high or low temperatures, and furthermore no good reasons can be adduced why steel having the extremes of tensile strength suggested would not work with entire satisfaction on parallel lines in the same structure.

In the recent specifications adopted by the union of German architects' and engineering societies, material is specified varying from 52,600 to 62,000 pounds per square inch. It is probable that these requirements are based upon the extensive use in Germany of basic Bessemer metal, a material which is little used here, and so far has no influence in determining the character of the product, and is several thousand pounds below what we should maintain for basic open hearth steel. The German specifications are confined entirely to the physical qualities and do not enter into the subject of the chemical composition. It is probable that our American engineers would not be inclined to omit the prevailing practice of chemical limitations. The proposed standard specifications of the Association for Testing Material prescribed a limitation for phosphorus and sulphur of 0.06 per cent. for basic steel. There is a tendency on the part of some engineers to specify lower limits for these elements, and it is an open question if anything is gained, and in fact if something is not lost, if these lower limits are secured. It is probable that when the metalloids are reduced to a minimum and the metal approaches the condition of pure iron, we have a very tender metal more liable to injury from heat and more susceptible to corrosion from atmospheric influences. We also reduce the tensile strength of the material. It has even been claimed by some observers that the extreme low phosphorus metal may yield inferior results in practice to that having a higher content of the metalloid. Altogether there is no evidence that chemical requirements lower than those specified by the association would offer any advantages in physical quality.

We have not so far developed any better system than the tension test, in which the elongation or the reduction of fractured area of the broken specimen serve as an indication of the quality of the metal. It is still an open question if this test alone is sufficient, and we frequently find evidences of material that affords satisfactory results from the ordinary tension test, but is found wanting under impact or stresses suddenly applied.

The method proposed by the late A. E. Hunt of punching and drifting and preserving a record of the results, is attractive and may possibly be developed on lines that will offer more satisfactory results than that afforded by the tensile test, and one that would probably be very acceptable to the manufacturer as reducing the expense and delay incurred by the preparation of test pieces. In our shop practice the punching machine still holds its place as a rapid and economical producer. The punching process on thin material is probably not attended with any measurable degree of injury to the metal. On material over ½ inch thick the prejudicial influences become more apparent, but the disturbance is so superficial on the interior of the punched hole that the removal of an extremely thin skin of the disturbed surface appears to leave the remaining material in a satisfactory condition. With accurate punching and these punched holes increased 1-16 inch in diameter by reaming, it is probable that the material will offer as good results as if drilled from the solid. Reaming of this extent is not attended with a serious addition to the shop cost.

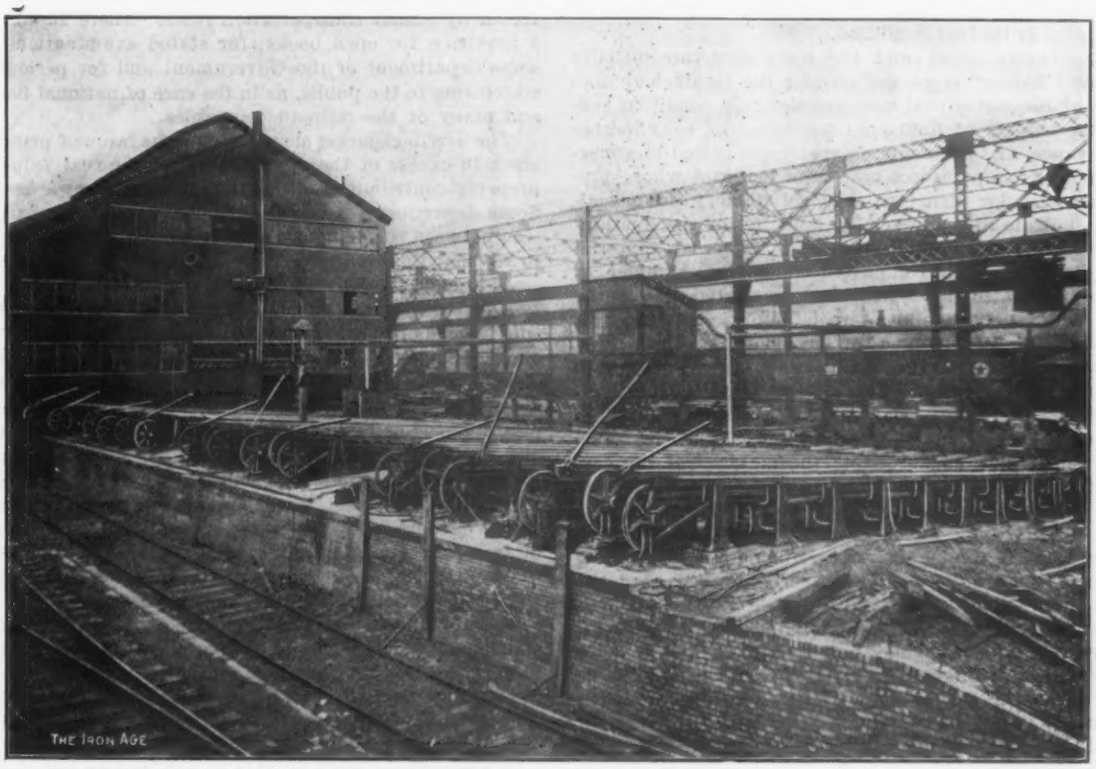


Fig. 12.—General View of Hot Beds of 14-Inch Continuous Mill and Crane Structure Over Shipping Yard for 40-Inch Blooming Mill.

THE DUQUESNE WORKS OF THE CARNEGIE STEEL COMPANY.

For eye bars and forgings of a similar class the best method of annealing is still an open question. The prevailing practice on ordinary steel is to raise the metal to a uniform temperature of about 1400 degrees F., and to cool from this refining heat uniformly and somewhat slowly. The tensile strength of the annealed bar, as compared to that at which it leaves the rolls, is determined by the rate of cooling. It is usual now to make an allowance of several per cent. reduction of tensile strength for the effects of the annealing. If the cooling occurred rapidly no such reduction occurs, and the full measure of tensile strength can be retained. No evidence has ever been presented that this rapid cooling would be injurious; in fact, it is what occurs with all material as it leaves the mill. On the other hand, it is not improbable that if the molecules of the metal and its constituent metalloids are in the most desirable condition when the proper degree of refining heat is attained, it would desirable to cool as rapidly and uniformly as practicable, so as to hold the structure of the metal in its best condition.

The coarse grain and the open structure usually found in bars of large section and the insufficient ductility of the metal that accompanies this condition render the subject of final heat treatment of considerable importance. Experiments on specimens raised to abnormally high temperatures and from material whose previous molecular structure was satisfactory do not always indicate any appreciable lowering of the ductility as exhibited by static tensile tests, whereas material that has been well compacted under the hammer or press with a final temperature considered above the safe limits may exhibit a satisfactory structure. If these conditions, which so far have not been thoroughly established, should prove to be facts, they would indicate that the faulty structure of the metal is a residual condition, due to the original casting heat. The action of the most powerful rolling mills is known to be somewhat superficial, and probably the material at the center of ingots and blooms is never sufficiently condensed until the bars are reduced to comparatively small sections. Everything indicates the desirability of giving compression to the ingots as a preliminary to the rolling process. Such an operation properly devised need not delay production, and it is probable that the result would be economical, due to solidification of material and reduction of croppings and waste.

Considerable interest is manifested in nickel steel as a high grade metal for important structures. Some experiments now being conducted on large eye bars of nickel steel may develop something worthy of consideration hereafter.

Judge Grosscup on the Remedies for "Trust" Evils.

Before the students of the University of Nebraska, at Lincoln, Judge Peter S. Grosscup of the United States Circuit Court delivered an address, from which we quote the following interesting passages:

A widespread withdrawal, by the people at large, from general ownership in the properties of the country cannot but be fraught with the gravest dangers. A few of these are so obvious that I need only indicate them. Such withdrawal will diminish, if not destroy, popular interest in national prosperity; for from those only who have a stake in prosperity can we expect great interest. It will kill off competition; for the competitor of the trusts must itself be a trust, and there will be no independent field from which to recruit the means to create such competitor. It will discourage still further the wage earner in any hope of becoming part owner, and thus deepen and widen the existing gulf between wealth and labor. It will sap to its foundation the real strength of government; for government must be built on the interests, as well as the affections, of the people governed. An industrial system subject to such indictment is a rising menace to free government itself.

The remedy, in general terms, it is not difficult to state. The first thing to do is to abandon the present policy of outlawry and extermination. That policy has failed. It has failed through conditions that cannot be removed by law. Replace the old policy by a new, under which industrial corporations, subjected to restraint against artificial prices, will be made, in organization and management, to invite, and worthily invite, the confidence and copartnership of all the people of the country.

To suggest concrete legislation is perhaps more difficult. It should include the repeal of the Sherman act. Logically and impartially enforced, that act forbids two grocers, on opposite corners of the street, from forming a copartnership to save expenses; partially enforced, it puts the industries of the land at the mercy not of the law, but of the officers of the law.

The legislation that replaces it should provide against artificial prices, brought about either by a cornering of the supply or by conspiracy; and also against discrimination in prices as to either buyers or places, except as affected by actual transportation rates. There should be a provision for open books; for stated examinations by some department of the Government and for periodical statements to the public, as in the case of national banks and many of the railroad companies.

The new legislation should forbid the issue of primary stock in excess of the cash paid in, or the real value of property contributed, to make up the company's assets. Some department of the Government should be charged —as between the company and the public—with the duty to see that this limitation was enforced.

Provision should, of course, be made for further issues of stock as the value of the property increases; but such issue as is based not on subsequently acquired property, but upon increased value due to management and operation, should be secondary, always, to the first, and should be put out only after judgment, by the appropriate department, that it was justified by the earnings and standing of the company.

To the extent that such subsequent issues represent increased value, due to management and operation, I would encourage, by every feasible method, its division in fair proportions between those who have furnished the capital and those who have done the work. I would embody the basis of such division in the contract of incorporation, so that it would operate as a contract right, and not as a mere bonus. Experience has shown that there is no way to so satisfactorily mitigate the struggle between capital and labor and none so just as a fair division of the harvest after both the reapers—capital and labor—have each had their reasonable hire.

A programme such as this is not, in my judgment, either radical or impracticable. It will be opposed, however, by those who look upon corporations of any kind as a menace to public liberty and by those who look upon restraint of corporations of any kind as an invasion of industrial liberty. It will be opposed by the men who are temperamentally apprehensive, by the men who believe the present good times to be due to present conditions and deplore interference, and by the men who still wait their opportunity to get rich out of present methods of trust organization. It will be opposed by those who have given to the subject no study, by those who are incapable of giving it a candid study, and by those who thrive in practicing frauds on public opinion. It will fail until public opinion is reached and educated. But public opinion will, in the end, be reached and educated. It will be made to see that a country is not made great by becoming rich; that a Government is not secure whose sole policy is to realize large dividends to capital and a large wage to laborers and to keep the peace between them; that there must be found firmer depths than these for the foundations of permanent security. We will then begin, in reality, to rebuild the industrial edifice—a new edifice made necessary by the change of time—but on the old foundations. We will anchor it, where our fathers anchored theirs, in a general proprietorship, so widely spread among the people and thus securely buttressed against hate and envy that time and change will thereafter dash in vain against the security of the State.

SUBMARINE TORPEDO BOATS.*

PAST, PRESENT AND FUTURE.

BY LAWRENCE SPEAR, NAVAL CONSTRUCTOR, U. S. N.

As the development of the submarine, although fairly continuous, has not been entirely orderly, no sharp line can be drawn between the past and present, and during the merging period the work of contemporaries must be arbitrarily classified. That period is here taken to include the years 1885 to 1891, inclusive.

The Past.

Up to the seventeenth century man's work under water was apparently confined to experiments with

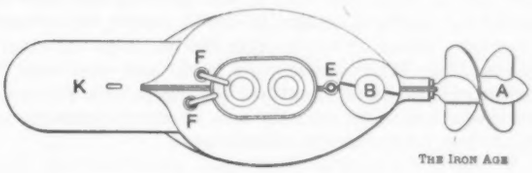


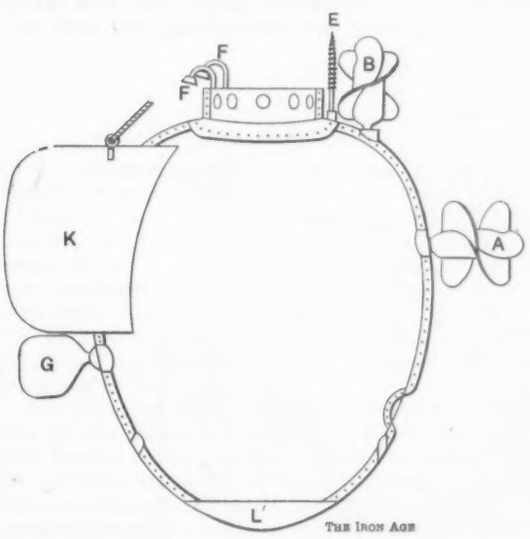
Fig. 1.—Plan of Fig. 2.

crude forms of the diving bell. In 1624 Cornelius Von Drebbel, a Hollander, invented and built the first real submarine boat, oar propelled and capable of attaining a submergence of 15 feet. No reliable data as to the dimensions and construction of this boat are available, but history tells us that she could carry 12 persons and was rendered habitable for a considerable period of time by the use of "quintessence of air"—probably compressed air or oxygen. The credit for the first boat is frequently given to an Englishman, Wm. Bourne, but there are good reasons for believing that his invention, which antedated Von Drebbel's really belongs to the diving bell class.

The history of the remainder of the seventeenth century and the greater part of the eighteenth shows but little real progress, for although some of the most important principles were grasped and recorded the practical results achieved were unimportant. During the seventeenth century the center of activity remained on the Continent of Europe, but in the following century the problem received its principal attention in England and America, and from the latter country in 1775 came the first important solution—viz., Bushnell's boat.

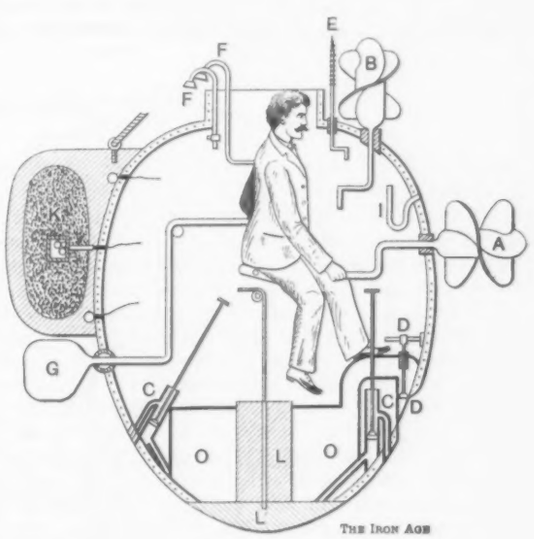
Bushnell's Boat.—With the appearance of Bushnell's boat—the pioneer torpedo boat, submarine or surface—the art of submarine navigation took a long stride forward and torpedo warfare made its bow, as did also the screw propeller, for although the latter had been invented in England some years previous it had never been practically applied. Three views of this vessel are given in Figs. 1, 2 and 3—a plan view, an outboard profile and an inboard profile. The information contained in the plans and explanatory legend gives a clear idea of the arrangement and relation of parts, so it will only be necessary here to touch on the general features of the design, which, all things considered, were well adapted to the purpose in view—viz., the attack upon ships at anchor.

The form, a sort of flattened ellipsoid with the depth



A.—Propeller.
B.—Vertical propeller.
C C.—Pumps.
D D.—Flooding valve.
E.—Torpedo screw.
F F.—Ventilators.
G.—Rudder.

Fig. 2.—Profile.



I.—Depth gauge.
K.—Torpedo.
L.—Ballast.
L'.—Detachable ballast and anchor.
O O.—Ballast tanks.

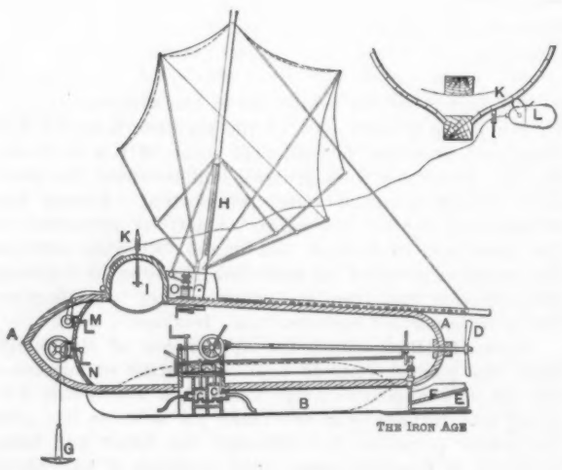
Fig. 3.—Section.

Bushnell's Boat.

exceeding the length and the length exceeding the breadth, was suitable for the strength and stability required. The balance of buoyancy and weight was effected by the water ballast system in the bottom, which also served as a compensating system for weights expended or received. A vertical screw, hand operated, controlled movements in the vertical plane, indicated by a depth gauge. The horizontal movement, gained by a bow propeller, was controlled by an ordinary rudder on the stern, the vessel being steered when submerged by compass. The air supply when sealed up was sufficient

* Abstract of paper read at the New York meeting of the Society of Naval Architects and Marine Engineers.

to sustain for half an hour the one man required to operate the vessel, and was renewed upon coming to the surface by exhaust and supply ducts with automatic operation. Lead ballast, detachable at the will of the operator, was fitted at the bottom, and was intended to



A A.—Hull proper.
B.—Hollow iron keel.
C C.—Pumps.
D.—Propeller.
E.—Vertical rudder.
F.—Horizontal.
G.—Anchor.
H.—Mast and sail.
I.—Conning tower.
K.—Torpedo spike.
L.—Torpedo.
M.—Torpedo gear.
N.—Water tight bulkhead.
O.—Mast gear.

Fig. 4.—Fulton's "Nautilus."

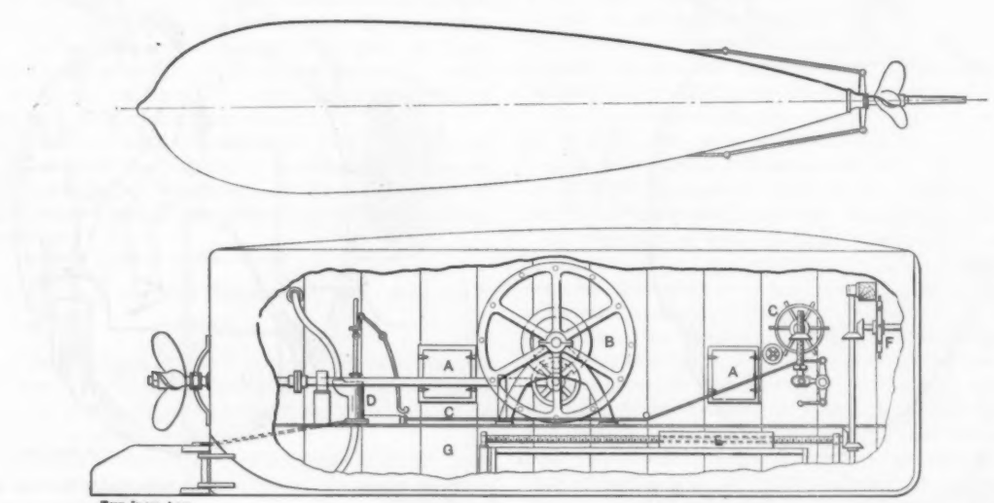
be used as an anchor and emergency safety appliance. The armament consisted of a gunpowder torpedo a trifle lighter than the water it displaced. This was carried on the stern of the boat and was intended to be attached to the hull of the enemy by a vertical detachable screw operated from the interior of the submarine. The release of the mine served to start the clock firing mechanism, which was set to admit of ample time for the submarine to clear the radius of explosion.

The fact is worthy of note that before building this vessel the inventor was required to educate his generation up to the possibility of exploding gunpowder under water and the resulting destruction of floating bodies in the immediate vicinity, so that he was practically the originator of the modern fixed mine as well as of the torpedo boat.

As to the qualities peculiar to the submarine, it will be noted that efficient means were provided for varying the relation of displacement to weight, and it is possible that some reserve buoyancy might have been forced under by the vertical screw. Apparently, however, this was not the designer's intention, nor was the boat so operated, so she must be classed with the later boats designed on the principle of equality of weight and submerged displacement.

The fact that this boat never succeeded in blowing up an enemy's vessel, though she made three attempts, was due solely to bad luck. The only adequately trained operator fell sick before the opportunity for action presented itself and the initial attempt was made by a half-trained man, who, starting from the New York shore, succeeded in reaching unobserved a 50-gun British ship lying off Governor's Island. He attempted to fix his torpedo without anchoring and failed, as at the first attempt the screw struck an iron rudder hinge pad, and in seeking a new spot he lost the ship and was surprised by daylight before he could renew the attempt. Two subsequent attempts upon British ships occurred in the Hudson River, above New York, and were also disappointments on account of the operator's failure to use his anchor. Eventually lack of encouragement and funds put a stop to the enterprise.

Fulton's Work.—The work thus abandoned by Bushnell was taken up shortly afterward by Robert Fulton, who in 1801, after some years of preliminary work, launched his first submarine, the "Nautilus," into the Seine at Paris. This vessel, an imperfect ellipsoid in form—extreme length about 21 feet, extreme beam about 6 feet—carried a hollow iron keel of a capacity equal to the reserve buoyancy in the light condition, which appears to have been very small. A double cylinder suction and force pump controlled the water ballast carried in this keel. The anchor and torpedo gear were carried in a non-water tight bow compartment and both were



A A.—Entrance hatch.
B.—Driving wheel for screw.
C.—Hand wheel for rudder control.
D.—Pump for draining ballast tanks.
E.—Trimming and diving weight.
F.—Wheel for moving weight E.
G.—Ballast tanks.

Fig. 5.—Bauer's "Plongeur-Marin."

SUBMARINE TORPEDO BOATS.

operated from the interior of the boat. The vessel was navigated from a hemispherical conning tower fitted on the bow; an ordinary stern rudder controlled the motion in the horizontal plane and a pair of horizontal rudders were fitted at the stern for control in the vertical plane. Two methods of propulsion were provided: 1, a hand operated screw propeller fitted at the stern, and, 2, a single mast and sail so arranged as to permit of folding and stowing from the interior of the boat. The pro-

peller originally fitted consisted of a single convolution, as did Bushnell's. This was later replaced by one of several blades, apparently the first propeller of modern form put to practical use. A compass and depth gauge completed the original equipment, which was augmented later by a pipe ventilation system and a crude compressed air system for breathing purposes only. The armament consisted of a gunpowder torpedo towed by the submarine and fired by contact. The plan, Fig. 4, gives a clear idea as to the method of operating the torpedo and as to the general arrangement of the vessel. Eventually Fulton and his crew of three men succeeded in remaining under water for a period of 4 hours and 20 minutes without ill effects. The strength of the structure limited the depth of submersion to about 25 feet. The maximum speed under sail was about 2 knots and submerged about 3 knots. This vessel, like Bushnell's, was designed for equality of weight and submerged displacement, and, as in the earlier vessels, this equality could be destroyed at will when necessary. The new features developed were the horizontal rudder, the double motive power, the conning tower and the compressed air system, all permanently established features of the best practice of to-day.

The "Nautilus" was subjected to thorough tests at Paris, Havre, Cherbourg and Brest, and the results of the tests were embodied in improvements until eventually she gave good promise of efficiency. However, the times were not yet ripe, and although Fulton and his projects created a furore, first in France and afterward in England, he failed to get his system adopted in either country, and eventually returned to the United States, where with Congressional aid his experimental work was continued for some years, culminating in an experimental attack on the brig "Argus," in which the "Argus" was victorious, though at the cost of rendering herself immobile by a system of spars and netting extending to the bottom.

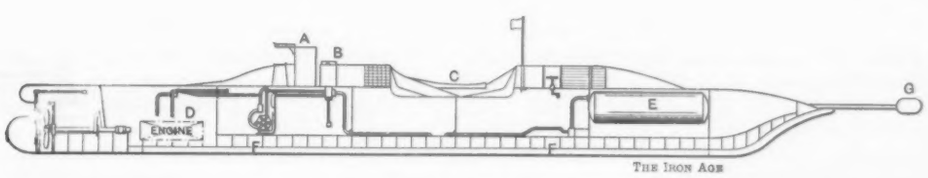
It is supposed that this experimental boat of Fulton's was the one employed in attacks on the British ships off New London in the War of 1812. These attacks forced the British commander to protect himself by the time honored custom of hiding behind prisoners of war. The complaints and protestations of the relatives and friends of the latter had their desired effect, and the attacks were discontinued.

With the exception of Fulton's work, the first half of the nineteenth century was nearly barren of practical results, but two proposals warrant mention here on account of the prophetic nature of the ideas advanced. The first proposal appeared in a letter from one "M. B." in the *Annals of the Arts and Manufactures* in 1801, describing a submarine designed to work on the bottom. Two pairs of wheels were fitted fore and aft for this purpose, the wheels being driven by cranks, and assisted when desired by a propeller in the stern; later, about 1828, this idea was again proposed by M. Castera. The second important proposal appeared in 1823 and was published in the *Annales Maritimes*. This proposal contemplated an iron hull of large size, driven by a steam engine on the surface and a gas engine when submerged, and included a telescopic conning tower and submerged projectile tubes, surely sufficiently ambitious and scientific for the period.

Bauer's Boat.—The decade from 1850 to 1860 covers the work of the Bavarian, Wilhelm Bauer, who designed several submarines and built two—the "Plongeur-Marin" in Germany and the "Diable-Marin" in Russia. Fig. 5 shows the first named vessel, and, with the legend, is sufficient for descriptive purposes. Aside from the iron hull, the most interesting feature of this vessel was the method adopted for steering and controlling in the vertical plane, the first real application of the principle of the longitudinal shift of weights. Her trials were fairly successful and she succeeded in breaking up the blockade of Keil by the Danish fleet. On account of the collapse of the stern under water pressure, she was eventually sunk in some 60 feet of water, the inventor and his crew escaping after an imprisonment of some hours. She has recently been located and raised and is now on exhibition at the naval school at Kiel. In Bauer's second vessel, the "Diable-Marin," longitudinal shifting of weights was supplemented by horizontal rudders, and an air lock for the egress of divers was provided.

An American contemporary of Bauer's, named Phillips, who experimented on the great lakes with a boat of considerable size, furnished the first example of automatic control in the vertical plane. This was effected by shifting water ballast fore and aft; the control being regulated by an automatic pendulum mechanism.

The proposals of this decade worthy of note here are those of Marié Davy and of Tètar Van Elven. The first suggested the electric drive and the second invented an optical tube for taking surface observations while submerged, which was the pioneer of the modern periscope.



A.—Entrance hatch.
B.—Diving regulator piston.
C.—Location of life boat.
D.—Engine.
E.—Compressed air tank.
F F.—Ballast tanks.
G.—Torpedo.

Fig. 6.—Brun & Bourgeois' "Le Plongeur."

SUBMARINE TORPEDO BOATS.

The history of the crude American submarines employed in the Civil War is well known, and being practically devoid of technical interest need not be recounted here, so that this short review of the submarine torpedo boats of the past may be brought to a close with a brief mention of four different types brought forward between 1860 and 1887—viz., the "Plongeur" of M. Brun and Bourgeois, the early boats of J. P. Holland, the Nordenfeldt and the Goubet boats.

Brun & Bourgeois.—The first of these, the "Plongeur," designed by Brun & Bourgeois, and launched in 1863, was an experiment on a large scale. The length was 136 feet; the beam, 19 feet, and the depth, 9 feet. She was armed with a spar torpedo and propelled by compressed air, which was also for the first time in history utilized for tank service. The final adjustment between weight and buoyancy was made by altering the latter, two pistons being provided for the purpose. The plan, Fig. 6, shows the general arrangement of the vessel. The means provided for control in the vertical plane were entirely inadequate for a vessel of her form and dimensions, and her behavior was exceedingly erratic; later her equalities in this respect were improved by horizontal rudders, but her performance was still so uncertain as to condemn the type.

The Holland Boat.—Mr. Holland's work began with a small one-man boat, built in 1877, which may best be described in the inventor's own words: "This boat, 14 feet 6 inches long, 3 feet wide and 2 feet 6 inches in depth, was rectangular in external cross section and spindle shaped inside, excepting in the middle section, which accommodated the operator clad in a diver's suit, and also a 4 horse-power petroleum engine in a separate water tight space. The water ballast was held between the internal and external shells. Two

small tanks at the sides of the central compartment held sufficient water to neutralize the reserve buoyancy. When the operator desired to leave the boat, the reserve buoyancy was first neutralized and then the water ballast was forced from the space between the shells into the central compartment around the operator, completely filling it, after which the manhole could be opened without difficulty. Reserve buoyancy was provided for and submersion was obtained by midship rudders."

The action of the submerging apparatus was not satisfactory, and in the next boat, length 31 feet, diameter 6 feet, displacement 17½ tons, finished in 1881, midship rudders were replaced by horizontal stern rudders. The experiments with this boat covered some three years, and the results attained demonstrated the practicability of forcing reserve buoyancy under by power from the propeller, the necessary inclination of the axis of the boat being obtained and controlled by rudder action alone. Continued development along these lines, both here and abroad, has produced the only successful and practical boats now existing.

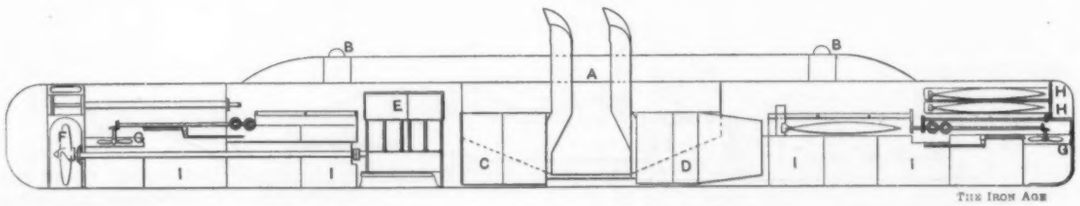
The Nordenfeldt submarines are principally useful as examples of what to avoid, but merit some attention here, partly on account of the ambitious nature of the designs and the attention they attracted, but principally by reason of the false conclusions drawn by the inventor from his experience, which conclusions variously and ingeniously misstated have served to hamper materially the development of the submarine along proper lines.

Nordenfeldt's attention was directed to the subject by a study of the work of an Englishman named Garret, with whom he later became associated, and the distinguishing feature of Garret's second boat was adopted in all of Nordenfeldt's designs—viz., steam propulsion, both on the surface and submerged; in the latter case steam being drawn from superheated water, partly contained in the boiler used for surface work and partly in special tanks. Fig. 7 shows an inboard profile of the last Nordenfeldt, No. 4, built in England, sold to the Russian Government and lost on the coast of Denmark while making the passage under her own power. This vessel had a length of 125 feet, a light displacement of 160 tons and a submerged displacement of 245 tons. With 150 pounds of steam her engines indicated 1000 horsepower. Her estimated speed was 15 knots on the surface in the light condition and 5 knots submerged. In the latter condition the radius of action was expected to be 20 knots. Coal was employed as fuel, and the bunker capacity was sufficient for a radius of action in the light condition of about 1000 miles at a speed of 8 knots. By employing some of the ballast tanks as bunkers this radius could be more than doubled. She was designed to do her submerged work with about 500 pounds of reserve buoyancy, which was carried under by two steam driven down haul screws, one at the bow and one at the stern. The valves of the down haul engines could be controlled by hand or automatically through a connection with a hydrostatic piston. These screws were relied upon to maintain depth and control in the vertical plane. The only remaining element of novelty was the employment for the first time of the automobile torpedoes, which in the first Nordenfeldt were carried in exterior tubes and in the one illustrated in the internal tubes.

The trials of No. 4 in the light condition were satisfactory, but as a submarine boat she was almost a total failure, as the down haul screws proved inadequate to prevent yawing, so that when under water she, like the "Plongeur," took charge and alternately sought the surface and the bottom, duplicating in this respect the behavior of the three previous vessels.

The principal seat of difficulty in all the Nordenfeldt boats was undoubtedly the large free liquid surface in the various tanks, resulting in a shifting center of gravity and a serious decrease of the designed stability. Large tank capacities were a necessary feature of Nordenfeldt's design, but the bad features thereof could have been largely reduced by subdivision.

Goubet's Boat.—The last type selected for illustration was designed by M. Goubet in 1885, and began her trials in 1889. An inboard profile of the vessel with explanatory legend is shown in Fig. 8. None of the main features of the design—viz., equality of buoyancy and weight, control in the vertical plane by the automatic longitudinal shift of water ballast and a steering propeller—were really novel, but it merits attention as the most successful example of its class. The small experimental boat proved successful on trial, thanks to the care taken with details; note, for instance, the minute subdivision of the ballast tanks. That the type has not been perpetuated is doubtless due to the absence of reserve buoyancy and the unsuitability of the control system for the forms and dimensions required to meet practical conditions.



A.—Entrance hatch.
B B.—Conning tower.
C { Boilers and
D { Reservoirs for hot water.
E.—Engine.
F.—Screw.
G G.—Vertical screws for trimming and diving.
H H.—Torpedo tubes.
I I.—Ballast tanks.

Fig. 7.—Nordenfeldt Submarine.

SUBMARINE TORPEDO BOATS.

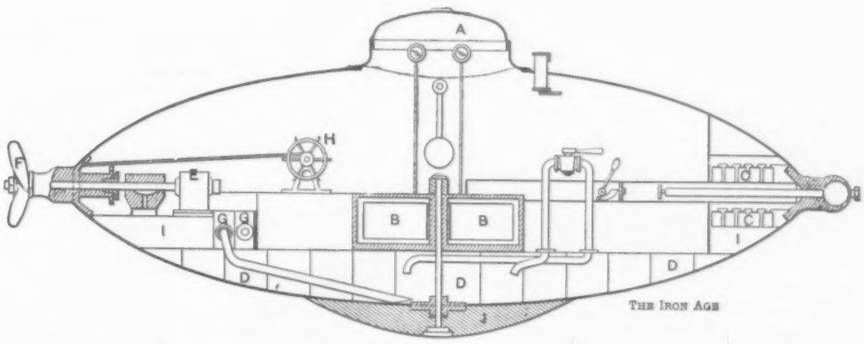
The Present.

The three leading nations in the construction of the modern submarine are France, with a total of 44 built, building or provided for; Great Britain, with ten, and the United States, with seven. The subject has been taken up by the other nations, but as their work is still in the experimental stage and but little reliable data is available as to progress it need not be considered here. Great Britain is working along American lines and therefore the present review may be confined to the French and American boats.

France.—The French fleet of modern submarines dates from 1886, when the then Minister of Marine, Admiral Aube, ordered the construction of an experimental boat, the "Gymnote"—length 59 feet, diameter about 6 feet, displacement 30 tons—from the joint design of Dupuy de Lôme and Gustave Zédé. Her spindle shaped hull was constructed of steel throughout; tank service was obtained from electrically driven pumps and also from a compressed air system, which in addition furnished air for breathing purposes. A telescopic conning tower was provided for observation on the surface and an optical tube for use below. The power installation consisted of a storage battery and a 55 horsepower motor driving a single screw. The reserve buoyancy was driven under from the propeller by inclining the axis of the boat, a pair of horizontal rudders being provided for that purpose.

The trials, beginning in 1888, were very exhaustive and led to the removal of the telescopic tower and a number of other alterations, principally in the propelling and diving gear. Eventually satisfactory results were obtained at a submerged speed said to be 6 knots.

The "Gymnote" was followed by the "Gustave Zédé," ordered in 1890, from the designs of M. Romazzotti and launched in 1891. The design followed closely that of the original "Gymnote," but on a much larger scale, the dimensions being: Length, 159 feet; diameter, 12 feet 4 inches; submerged displacement, 266 tons. The hull was of bronze throughout. She was fitted with a single screw, driven by two 360 horse-power motors, fed by a storage battery of 720 Laurent Cély cells. She carried three Whitehead torpedoes and one bow tube.



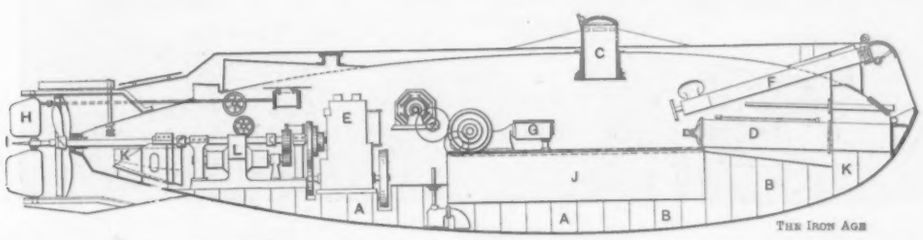
A.—Conning tower.
B B.—Compressed air tanks.
C C.—Storage batteries.
D D.—Ballast tanks.
E.—Motor.
F.—Adjustable screw.
G G.—Pumps.
H.—Wheel for adjusting screw.
I.—Trimming tanks.
J.—Detachable weight.

Fig. 8.—"Goubet."

The step from the "Gymnote" to the "Zédé" proved too large a one and extensive trials and many alterations were necessary before the "Zédé" gave satisfaction. Evidently the designer of the "Zédé" did not take full advantage of the data derived from the "Gymnote," as the alterations in the two cases were along the same lines. The telescopic conning tower was abandoned for a fixed one, the set of horizontal rudders at the stern was supplemented by the addition of a set amidships and a set forward, and the voltage and power were cut in two by the removal of half the cells from the battery. Reports as to her speed in her final form are conflicting, but it is probably about 8 knots. Her behavior in other respects is evidently good, as is shown by her known performances in various maneuvers noteworthy the torpedoing of the "Martel" in the harbor of Ajaccio during the maneuvers of 1901.

In 1896 the Minister of Marine invited designs for a submarine not exceeding 200 tons displacement, which should carry two torpedoes ready for launching and have a radius of action on the surface of 100 miles at 12 knots, submerged of 10 miles at 8 knots. Of the 28 designs submitted in accordance with this call three were awarded prizes, though the first prize of 10,000 francs was withheld. From among these designs that of M. Laubeuf was later selected for development, and finally took substance in the "Narval," launched in 1899. Her particulars are: Length, 111 feet 6 inches; beam, 12 feet 4 inches; displacement, light, 106 tons; submerged, 200 tons. A water tube boiler burning petroleum supplies steam for a 250 horse-power triple-expansion engine used for surface propulsion, and for charging air flasks and recharging the storage battery. As to the details of the electric installation little is known except that two motors are employed. The armament consists of four torpedoes in Drzewiecki carriers. The speeds and radii of action are reported to be as follows: Maximum surface speed, 12 knots; radius at that speed, 242 miles; radius at 8 knots, 625 miles; maximum submerged speed, 8 knots; radius at that speed, 25 miles; radius at 5 knots, 70 miles. As to submarine qualities, the design of the "Narval" follows the "Morse," and aside from the double power installation the only item of particular interest is the construction adopted for the hull, which is a development of the system employed in the first Holland boat—viz., complete double bottoms, or rather double skins, the inclosed space being entirely full of water when submerged. The French authorities appear to be well satisfied with the "Narval," except as to the length of time necessary to pass from the light to the diving condition, which is excessive. In later boats of her class that time has been reduced somewhat, but the fault has not been wholly eradicated.

United States.—The modern American submarines all belong in the "submersible" class and date from 1895, when the Navy Department, after competition, selected a Holland design and entered into a contract with the Holland Torpedo Boat Company for the original "Plunger." The history of that vessel is so well known that it will only be necessary here to recall to mind her principal features, which were: Length, 85 feet; diameter, 11 feet 6 inches; light displacement, 140 tons; submerged displacement, 165 tons. A petroleum burning boiler furnished about 1500 horse-power, which was divided between two screws. A storage battery and motor were provided for submerged work. She was designed for 15 knots on the surface and 8 knots submerged, and was fitted with down haul screws to assist her horizontal rudders. This combination was never



A A.—Ballast tanks.
B B.—Gasoline tank.
C.—Conning tower.
D.—Expulsion tube.
E.—Gas engine.
F.—Dynamite gun.
G.—Air compressor.
H.—Steering rudders.
I.—Diving rudders.
J.—Battery tank.
K K.—Trimming tanks.
L.—Motor.

Fig. 9.—The "Holland."

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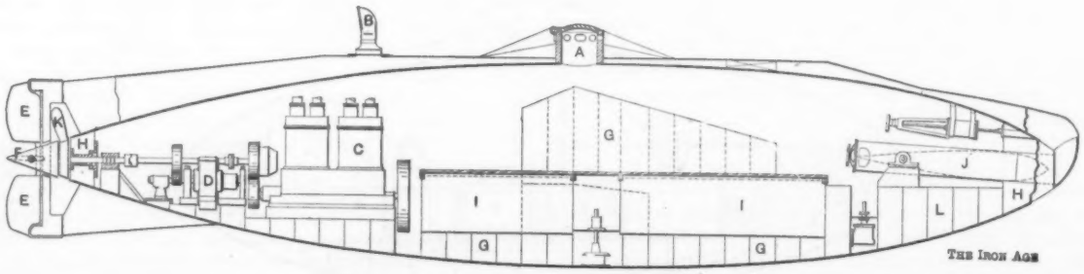
put to a practical test, as the enormous steam power installed in a very limited space rendered her practically uninhabitable on account of the high temperature developed. Her construction was eventually abandoned and a contract was entered into for a new "Plunger" of a truly modern type.

The "Holland."—While the old "Plunger" was under construction for the Government the same company brought out privately the "Holland"—length, 53 feet 10 inches; diameter, 10 feet 3 inches; submerged displacement, 75 tons. She was propelled on the surface by an Otto gasoline engine of 50 horse-power, and when submerged by a 50 horse-power electric motor fed by a storage battery of 60 cells with a capacity of 1500 ampere hours at a four-hour rate of discharge. A double commutator was fitted on this motor so that 150 horse-power could be safely developed. Her final armament consisted of one bow torpedo tube, one bow pneumatic dynamite gun and three short Whitehead torpedoes. Her surface speeds are 6 knots under the gasoline engine and about 8 knots under the motor, and her submerged speed is 5½ knots under the motor. A single pair of horizontal rudders at the stern, operated by air engines, serve to control her in the vertical plane. These engines, as well as the vertical rudder engines, were arranged for automatic operation when desired, but experience has proven the entire feasibility of brain control and the automatic attachments are seldom, if ever, used. Air compressors and reservoirs furnish air for the steering and diving engines, tank and torpedo service, as well as for breathing purposes. The reserve buoyancy resides in the conning tower, which was originally telescopic, but is now fixed. An inboard profile of the "Holland" is shown in Fig. 9 and some photolithographic views under various conditions in Figs. 11, 12, 13 and 14.

The "Fulton."—In 1901 the same company brought out the "Fulton," built as a trial vessel for the seven Government boats, "Adder," "Moccasin," "Porpoise," "Shark," "Grampus," "Pike" and "Plunger," for which contracts were entered into in 1900. The general features of the "Holland's" design have been followed closely in her, but she is larger, roomier, faster, and is simplified and improved as to details. Her particulars are as follows: Length, 63 feet 4 inches; diameter, 11 feet 9 inches; total displacement, 122½ tons. On the surface she is propelled by a 160 horse-power four-cylinder Otto gasoline engine, and when submerged by a 70 horse-power electric motor fed by a storage battery of 60 cells, with a capacity of 1900 ampere hours at a four-hour rate of discharge, average potential 110 volts. Pneumatic engines for the steering and diving rudders, the latter with both hand and automatic control, were originally provided. These have since been removed and a simple and efficient hand gear has been substituted therefor. She carries one bow tube and five short Whitehead torpedoes, with water compensation. The engine and motor are so geared up that either can be



A.—Conning tower.
B.—Ventilator.
C.—Gas engine.
D.—Motor.
E.—Steering rudders.
F.—Diving rudders.
G G.—Ballast tanks.
H H.—Trimming tanks.
I I.—Battery tanks.
J.—Torpedo expulsion tube.
K.—Propeller.
L.—Gasoline tank.

Fig. 10.—The "Fulton."

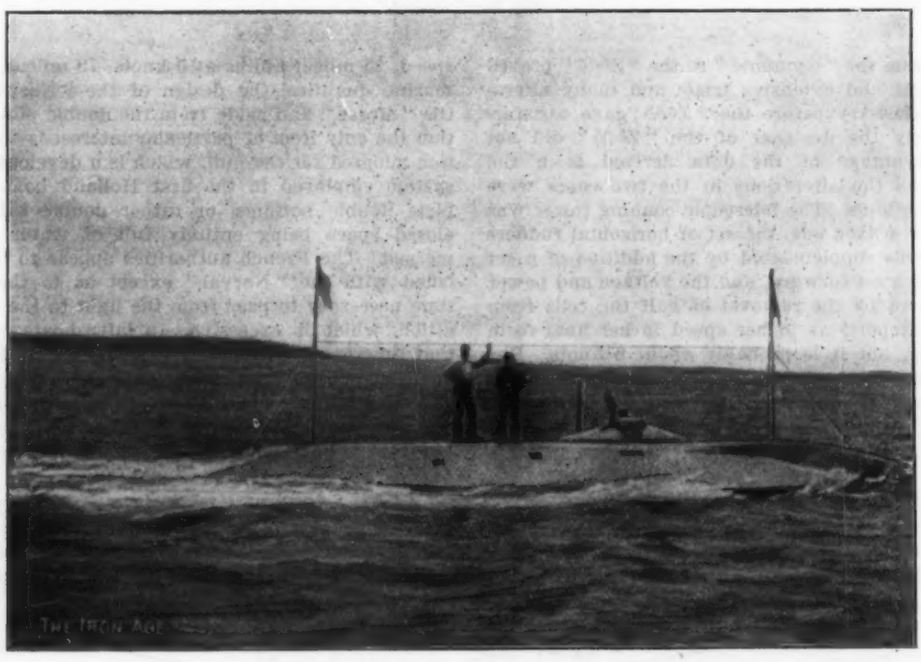


Fig. 11.—"Holland."—Normal Speed Under the Motor.—Light Condition.

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used to operate the auxiliary machinery, which comprises an air compressor and a powerful rotary pump. The compressed air capacity for torpedo and tank service is 40 cubic feet at 2000 pounds pressure, suitably reduced for various uses. The change in the relative power of the engine and motor is a large step in advance over the original "Holland," as it enables fair speed on the surface—viz., 6 knots—to be made while

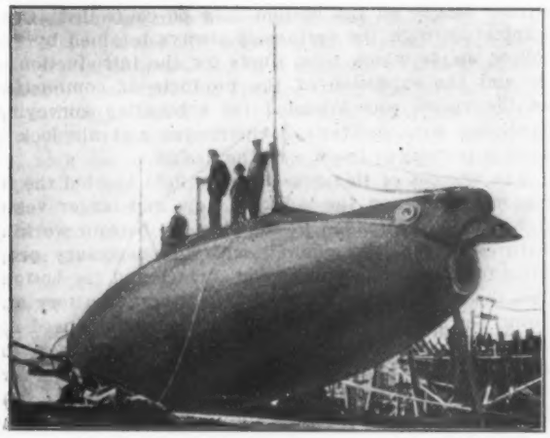

Fig. 12.—Bow View of the "Fulton."

ing this time the only fresh air supply was that furnished by a leaky valve, which allowed the pressure in a flask of 5 cubic feet capacity to run down from 2000 to 1900 pounds per square inch. When the vessel was opened up the air was still reasonably sweet and pure and the crew suffered no unpleasant effects. Her habitability under service conditions was tested last spring by a voyage under her own power from New Suffolk,

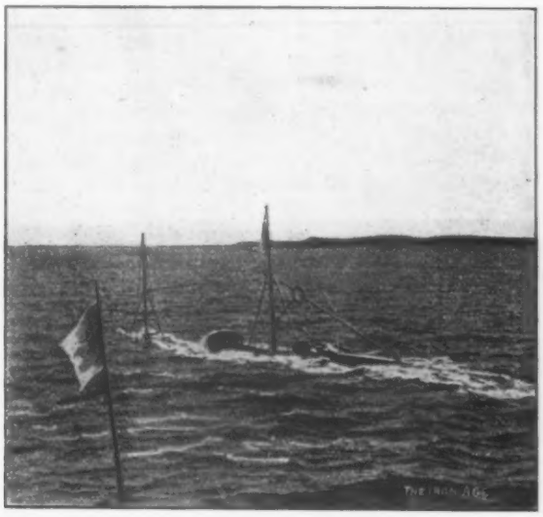

Fig. 13.—The "Fulton" Diving.

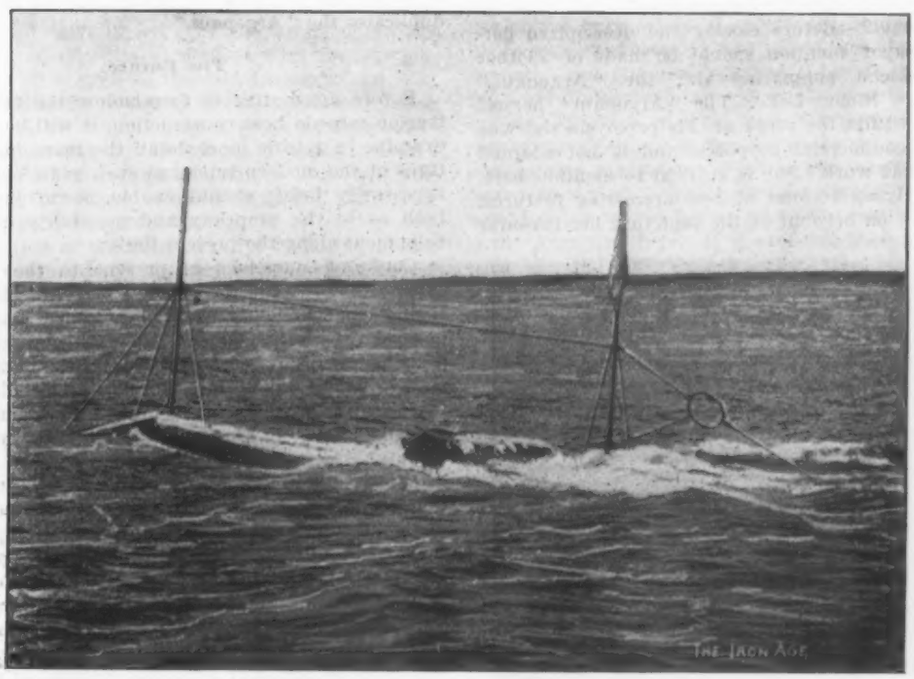

Fig. 14.—The "Fulton" Rising.

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charging batteries. Her speed and radii of action are as follows: In the light condition, under the gasoline engine, 400 knots at a speed of 8½ knots and 560 knots at a speed of 6 knots; in the semi-awash condition, under the gasoline engine, 340 knots at a speed of 7 knots; in the submerged condition, under the electric motor, 21 knots at a speed of 7 knots and 35 knots at a speed of 5½ knots, and ready to dive, with the conning tower only showing, she has a maximum radius of 100 knots at a speed of 3 knots.

In November, 1901, this vessel, with a full crew, was submerged at her dock for a period of 15 hours. Dur-

L. I., to the Delaware Breakwater. The first leg of the journey, from New Suffolk to New York, was made through Long Island Sound at an average speed slightly exceeding 8 knots. The second leg, from New York to the Delaware capes, was made under half power at an average speed of 6 knots, except for an hour and a quarter during the journey which was occupied by submerged runs. Her ultimate destination on this trip was Chesapeake Bay, but the voyage was brought to an abrupt termination at the Delaware Breakwater by an explosion of battery gas which had been allowed to accumulate underneath the battery deck. The presence of

the gas was due to deterioration of the battery caused by accidental submersion in salt water. An inboard profile of the "Fulton" is shown in Fig. 10 and some photographic views of the "Holland" and "Fulton" under various conditions in Figs. 11 to 16.

The Government boats "Adder," "Moccasin," "Porpoise," "Shark," "Grampus" and "Pike" are practically duplicates of the "Fulton." The "Plunger" is

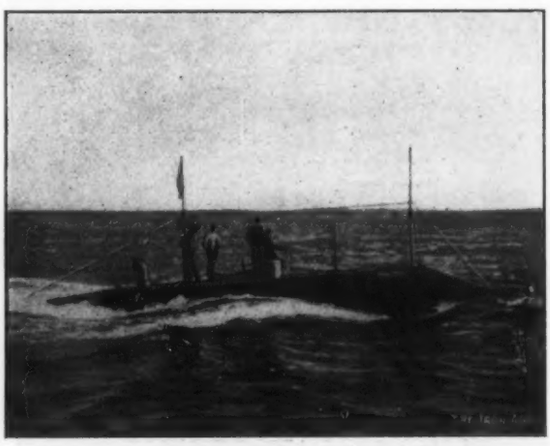

Fig. 15.—Full Speed Under the Gasoline Engine of the "Fulton."

the same in dimensions and general arrangement, but differs in some details, the most important of which is the armament, where three long Whitehead torpedoes have been substituted for five short ones.

The "Argonaut."—Before closing the descriptive portion of this paper mention should be made of another modern American submarine—viz., the "Argonaut," brought out by Simon Lake. The "Argonaut" herself does not fall within the scope of this paper, as she was designed for commercial purposes, and is not adapted for torpedo boat work. She is entitled to mention here, however, partly on account of her interesting features, but principally on account of the fact that her inventor

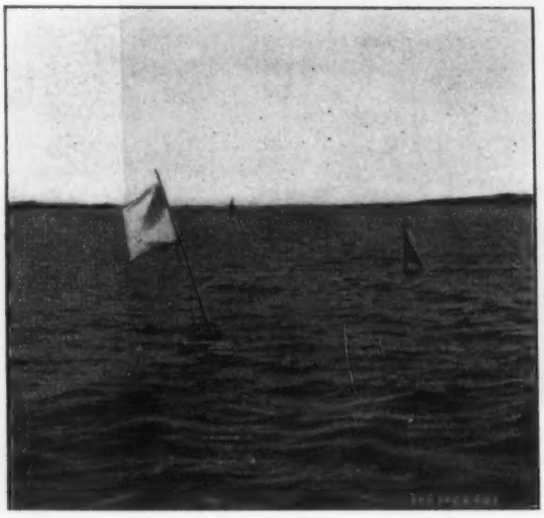

Fig. 16.—The "Fulton" Passing Between Flags 150 Feet Apart at the End of One Mile Run.

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is building an experimental boat embodying her principal features, but intended also for torpedo boat work. The approximate dimensions of the "Argonaut" are as follows: Length, 36 feet; diameter, 9 feet; displacement submerged, 60 tons. Her under water work is confined altogether to operations on the bottom. A 30 horsepower gasoline engine propels her on the surface by a single screw, and on the bottom by this screw or a pair of driving wheels, or both, as desired. The guide wheel serves as a rudder, both on the surface and submerged. In common with other submarines, she has a water ballast, compressed air and electric light system, which present no novel features except as to the bow searchlight for examination of the bottom. She is submerged by down haul weights of 1000 pounds, attached to suitable windlass mechanism by which any amount of reserve buoyancy not exceeding the down haul weights may be hauled under. The water ballast system enables the relation between the down haul weights and the reserve buoyancy to be altered at will, so that the virtual weight on the bottom may be controlled. Communication with the surface is always retained by two hollow masts which form ducts for the introduction of air and the expulsion of the products of combustion. As the vessel was intended for submarine surveying, wrecking, &c., a diver's compartment and air lock is made a prominent feature of the design.

The success of this vessel in her field has led the inventor to place on the stocks a new and larger vessel in which it is intended to combine the bottom working features of the "Argonaut" with the necessary properties for operation between the surface and the bottom. This vessel is to be fitted up with a storage battery and motor, so that communication with the surface need not be retained. The apparatus for controlling between the surface and bottom will consist of inclining planes fore and aft, termed by the inventor "hydroplanes." The design contemplates great stability, the intention being to maneuver on an even keel, the hydroplanes serving simply to give a vertical thrust, but no turning moment about the center of gravity. At the time of writing this vessel has not been launched, so no data are availble as to the efficiency of the design, except in so far as it duplicates the "Argonaut."

The Future.

Before attempting to foreshadow the future of submarine torpedo boat construction, it will be desirable to examine in a little more detail the more important features of the modern types, as such examination, though necessarily brief, should enable us to judge roughly both as to the propriety and possibility of future development along the present lines.

Confining ourselves at present to the submersible type, we note that the French and American designs, though independently worked out, are identical as to general principles and close to each other in the main features of design, the difference in the aims of the designers being taken into account. The distinguishing features of submarines are, first, reserve buoyancy, and second, control in the vertical plane by rudder action only.

Reserve Buoyancy.—The presence of reserve buoyancy undoubtedly increases the difficulty of securing complete and satisfactory control in the vertical plane, as no matter where located it introduces an upward force which requires balancing, and it may, in addition, introduce a turning moment about the center of gravity which also requires balancing. Its advantages, however, entirely justify its presence, since it not only serves as an instantly available element of safety in an emergency, but also permits the submarine to maintain the awash condition, whether underway or not, without change of ballast or direct expenditure of power. In this condition, ready to dive instantly, presenting only the conning tower as a target, and herself commanding a complete view of the horizon, the submarine will do a great part of her work, even in the event of the perfection of observation apparatus for use when submerged. It is safe to conclude then that this feature has been permanently adopted.

Control.—The second characteristic—viz., control in the vertical plane by rudder action only, is also fully justified by tactical and construction reasons. It is obvious that a change in depth can be effected in the least time and by the least expenditure of energy, if the vessel be moved in the direction of least resistance; in other words, if she is steered up and down inclines by altering the angle of her longitudinal axis to the horizon. In order to be effective the turning moment used must

be of considerable magnitude and under the most sensitive control, conditions best met by horizontal rudders, which have also the advantages of simplicity and economy of space, weight and power. Other things being equal the rapidity with which a submarine can rise for observation and dive again is a direct measure of its efficiency, since its chance of escape from observation or projectiles is in inverse proportion to the period of exposure. As pointed out below, a loss in this quality may be justified when balanced by a corresponding gain in the equally important tactical feature of speed, but in no other way; hence it may fairly be concluded that this feature also has come to stay.

The correspondence between the French and American designs extends also in a general way to the most important construction feature—viz., the power plant. For submerged work both have adopted the electric drive, and for surface work and recharging batteries, &c., both go back to the hydrocarbons, the American using the light oil gasoline, with an explosive engine while the French employ a heavier oil, petroleum, and transform its energy into steam instead of using it direct in an explosive engine.

American System Best.—From a purely theoretical point of view, the American system is better adapted to the purpose, involving as it does only one variable weight—viz., fuel, against two for the other—viz., fuel and feed water. This leads directly to simple and rapid compensating arrangements tending toward a reduction in the time necessary to pass from a cruising to the fighting condition, a tendency still further helped by the absence of the high temperature accompanying steam propulsion, as well as the slow working apparatus for the escape of the products of combustion. In general simplicity and economy of space the American system offers additional advantages. On the score of safety the advantage, if any, lies at present with the French. A less volatile oil is used in the first instance, and it is probably less difficult to secure the complete expulsion of the products of combustion. The advantage, however, is not important as the danger element in either case is well within permissible limits and will undoubtedly be still further reduced in future boats employing the American system by the use of heavier oils and the perfection of the apparatus for disposing of the products of combustion. The principal advantage of steam propulsion lies in the fact that the designer can avail himself of very complete data based on experience, whereas since the marine oil engine of the power now required is practically new in the field, the designer is hampered by lack of reliable data. Ultimately, however, the oil engine will probably displace the steam engine, since the development of the former offers the possibility of a single motive power for all conditions, which will be reasonably efficient in the submerged condition. Modern chemistry is already in a fair way to provide the materials for supplying the necessary oxygen in such form as to meet the conditions imposed in a submarine. In the meantime the growing field of the oil engine, both afloat and ashore, will supply the experience necessary for the development of the largest powers apt to be used in the submarine.

Electric Drive.—The remaining important feature common to both designs is the employment of the electric drive for submerged work. The storage battery and motor are admirable in some respects, but exceedingly inadequate in others, the principal objection being the well known one of excessive weight and space in proportion to the power developed. When it is stated that a weight of 370 pounds per horse-power hour is a fair average for a suitable installation, it is readily seen that there is much room for improvement. Another disadvantage of the battery lies in the care and attention necessary for its safe operation after sensible deterioration has set in. The difficulty which takes the shape of abnormal behavior with respect to "gassing" may, under certain conditions, result in an explosion, such as took place on the "Fulton" last spring, and more recently on the "Holland." Fortunately, however, this condition is not inevitable, and is susceptible of control when it does occur.

There is no particular quarrel with the motor, except as to the difficulty in fitting it with a suitable propeller, and the battery bids fair to develop faster in the future than in the past, on account of the increasing demand for a light, compact battery for automobile use. Its continued use may thus be expected until the appearance in practical form of a development of a heat engine similar to that hinted at above.

The principal difference between the French and American designs lies in the choice made of dimensions and proportions, which appears to be the direct result of different ideas as to the relative values of speed and maneuvering qualities. To attain the high surface speed desired the French designers have been forced to adopt a considerable displacement, great length in proportion to beam, the double hull with large tank capacity, and incidentally the steam engine and multiple rudders. As compared with the Holland boats, the increase in surface speed is gained by a sacrifice of efficiency in three directions: 1, As to simplicity; 2, as to the length of time necessary to pass from a cruising to the diving condition, and, 3, as to the necessary period of exposure for conning tower observations. No exact data are available as to the minimum observation period required by the French boats, but their extensive use of the periscope indicates a relative inferiority in this respect. In shallow water at least this result would naturally follow from the dimensions and form adopted, as it is probable that the rudders are then used to produce not only a turning moment, but also a vertical thrust.

While the limit of surface speed for a given displacement has not yet been reached for either type, further material advances are most apt to be made by further increases in displacement. The limit to this process is not set by construction reasons, but by the probable use of the type, which for any one country is fixed by its geographical location and the nature of its coast and harbors. For instance, a submersible of the "Narval" type and dimensions is for France not only a defensive, but an offensive weapon, and the partial sacrifice of submarine qualities in the design is warranted by the possibilities for offensive use. The same boat transferred to America would become purely defensive and would not be so well adapted to the conditions here as is the American type. It is probable then that in countries situated like France, where the possible enemy possesses large ports and arsenals within easy striking distance, the submersible will eventually be increased in displacement to perhaps 300 tons, in order to obtain a vessel which shall be seaworthy in a large sense, habitable for considerable periods, self supporting and capable of a fairly high sustained sea speed. Such a boat would be first and foremost a weapon of offense and only incidentally a weapon of defense, in which field its place would be taken by several smaller units. Whether these units should be of the submersible or pure submarine type depends upon the extent of the coast, the number of harbors, the internal water ways and the condition of the fixed defenses. As noted above, France has adopted for this purpose the submarine of the Perle type, a course which is probably justified by the small number of her harbors and her highly organized fixed defenses.

Turning now to the United States, her location with respect to possible enemies is such that there is no immediate prospect of the development of the large submersible into an offensive weapon; still the extent of her coasts, the number of her harbors and rudimentary character of her fixed defenses render this type preferable to the pure submarine for defensive purposes. The development of the best all round boat to meet the conditions is likely here also to lead to some increase in total displacement, which eventually, however, will probably not exceed 200 tons. As compared with the larger offensive submersible, such a vessel would be less seaworthy and would have less surface speed, better maneuvering qualities and greater submerged endurance. The pure submarine would thus at first glance appear to be an undesirable type for the conditions prevailing in the United States, but this is only true so long as the sole aim is torpedo work. As a matter of fact, however, the usefulness of the submarine

is not confined to this one function, as it affords to-day the best known means for the destruction of mine fields and cables and the reconnoitering of fortified harbors. The objective being far removed, it is essential that the dimensions and weight of this type of vessel be kept at the lowest limit in order to admit of transportation by battle ships, armored cruisers and the larger class of scouts. In such a vessel some armament would be desirable for attack upon stationary shipping, dry docks &c., but this feature should be subordinated to the features necessary for efficient bottom work. By taking full advantage of the latest developments in diving apparatus all the essential features, including efficient signaling apparatus, could to-day be combined in a maximum length of 35 feet and a maximum displacement of 25 tons. This appears to be the only possible guise in which the pure submarine may play an offensive *rôle*, and even here, in the author's opinion, means for recharging batteries are desirable and justifiable, as scout work might require a considerable radius of action.

Conclusion.

To sum up, it appears that the submarine boats of the near future will naturally divide themselves into four types and two main groups, to conform to the different conditions in the different maritime countries. Group 1 would be suitable for many of the European countries, and would include the large offensive submersible, self supporting, with auxiliary bottom working features, and the small defensive submarine for torpedo work only. Group 2, suitable for the United States and similarly situated countries, would include the small offensive ground working submarine or submersible (with auxiliary armament) and the medium sized defensive submersible for torpedo work only. It appears, further, that the submarine qualities of the modern boats are based on sound principles, and that the future development of the four different types within the limiting displacements of each must be along the present lines, and in the direction of improvement in the tactical qualities of speed and practical radius of action. As pointed out above, improvements in these respects are largely dependent upon the general improvement of the power installations, and as compared with the corresponding feature in the main objective, the battleship, the improvement in the submarine bids fair to be the more rapid.

The Rewards to Workmen in the Vickers, Sons & Maxim Works.

Through the courtesy of Vickers, Sons & Maxim, Limited, Barrow-in-Furness, England, we are enabled to present the following rules formulated by them to govern the payment of rewards to their workmen for new ideas:

With reference to the notice of March 18, 1902, notifying workmen who have any ideas that will facilitate the production of work, to submit them for consideration, an Awards Committee has been formed in order to deal with any proposals that may be forwarded, and the following rules will govern the action of this committee, and awards may be recommended for the following:

a. Any machine or appliance that may be invented or introduced, and which leads to the economical or efficient production of work.

b. Any new method of carrying on, or arranging work, that leads to similar results as in *a*.

c. Any suggestion by which waste of material may be avoided.

1. The committee may make an award not exceeding £15, and if, in the opinion of the committee, an invention before them is of greater value, they will submit a report to the firm with a recommendation.

2. Should the committee consider an invention worthy of protection by patent, the firm may agree to cover cost of provisional protection or patent, in addition to any award recommended by the committee, but, if so, it will be on the understanding that the firm shall have for all time the right of use free from royalty or patent claims.

3. The committee is empowered to make awards only for inventions or proposals under the heading *a*, *b*, *c*, but will be prepared to consider any suggestion associated with the works or the manufactures carried on therein, forwarding, if thought desirable, a recommendation to the firm.

4. The following form the Awards Committee: G. H. Banister, chairman; W. Gordon, C. G. Roberton, and T. Pickup, secretary. In case of difference of opinion, the committee shall decide by vote, the majority ruling.

5. The committee may call before them for evidence on the claims submitted any person in the employ of the firm.

6. The firm reserve the right to modify, change or annul any or the whole of the foregoing rules.

Development of Gas Engines of Large Units.

BY FRED. B. WHEELER.

In America the development of gas engines for power in large units has been, so to speak, "on the waiting list," until the ability of a large unit to operate continuously under all load conditions should be thoroughly demonstrated. This has now been universally proven. As a result, during 1902 a sudden jump has been taken by the leading American as well as Continental builders, and their shops are crowded with orders, large units taking the lead. In 1900 the 600 horse-power Cockerill engine was shown at the Paris Exposition. In 1902 that enterprising firm prepared to build a 5000 horse-power four-cylinder double tandem Simplex type, they actually having produced 1250 horse-power from a single cylinder.

The Snow Steam Pump Works of Buffalo are finishing two of 4000 horse-power each, while the De La Vergne Refrigerating Machine Company and Westinghouse Company are building 30 large units.

In England the first engine over 400 horse-power was put in operation in 1900 on Mond producer gas. Yet in August, 1902, two English firms were building 51 engines aggregating 17,600 horse-power, mostly for central station lighting, where steady regulation is required.

The state of the art has now so far advanced that the subject of gas engines should be divided into four grand divisions for due consideration:

1. Natural gas.
2. Producer gas.
3. Illuminating gas.
4. Blast furnace gas.

The subject may well be divided further into

Pumping engines { *a.* For natural gas. *b.* For water.

Central station use.

General power purposes.

We will briefly consider these in order:

Natural Gas Engines.

Because of failing rock pressures and increasingly greater distances to pump, reaching to nearly 200 miles, the inventive faculty of our best engineers has been exerted how best and most economically to transport the natural gas. At first ordinary steam engines, then the latest types of compounds, driven by gas fired boilers, were used. Now giant compound natural gas engines are being installed with great success.

The Snow Steam Pump Works of Buffalo, N. Y., have installed six 1000 horse-power compressors and are building two 4000 horse-power compressors, the most enormous gas engines ever constructed. The 1000 horse-power engines have four single acting power cylinders, 25 x 48 inches, two cylinders on each side of the main shaft, all four connected to the main crank pin. The crank at the other end of the main shaft drives the compressor pistons. The crank is 90 degrees from the power crank, so that the periods of maximum power and resistance nearly coincide. These engines run at 100 revolutions per minute. Compression is carried to 100 pounds pressure in the power cylinders, which gives an initial pressure of about 500 pounds. These engines have throttling speed governors, also automatic cut off valves

which open wide and allow the mixture to enter the cylinder at almost atmospheric pressure until the speed governor cuts off the supply at one-eighth of stroke, or later, according to need. The engines, tested, develop a delivered horse-power in the compressor cylinder on 8.50 to 9 cubic feet of natural gas of 1050 British thermal units per hour. Their mechanical efficiency is 82 per cent. All parts of the cylinders, pistons, rods and valves are water jacketed. The engine is automatically stopped upon a failure of the water supply in the following manner: Jacket water pressure, acting on the diaphragm and connected to a latch, holds the latch always in this fixed position as long as water pressure is acting on the diaphragm. The water pressure on the diaphragm is resisted by a spring so arranged that when water pressure is removed at any time the spring forces the diaphragm cap over into the other extreme position and withdraws the latch, allowing a small weight to fall, closes a stop valve in the gas supply pipe and shuts down the engine, preventing damage.

The Snow Company are finishing two 4000 horse-power engines for Cleveland, each having four double acting power cylinders, 37 x 60 inches, and two compressor cylinders, 22 x 60 inches. These engines weigh 1,300,000 pounds each, and are expected to develop in the compressor cylinders 1 horse-power on a consumption of 7.50 cubic feet of gas of 1050 British thermal units. The main shaft is 24 to 28 inches in diameter. There are four bearings, 24 inches diameter, the inner ones 42 inches long, the outer 36 inches long; one fly wheel, 22 feet diameter, weighing 80,000 pounds. For starting these large units a small auxiliary compressor and a mixing tank are used. The efficiencies shown by these figures surpass greatly the results reached by compound steam engines with natural gas fired or coal fired boilers.

Under the sub-heading "Pumping Engines for Water," it may be noted that the city of Philadelphia is installing a high pressure fire service pumping station to contain ten vertical 280 horse-power 18 x 22 inch Westinghouse three cylinder, single acting engines and two 125 horse-power 13 x 14 inch Westinghouse, all direct connected to Deane triplex double acting piston pumps working against a 300-pound pressure. These engines use illuminating gas.

The ability to start quickly without preliminary warming up and the saving of a large boiler plant under expensive constant slow steaming caused the Fire Department to install this service.

Producer Gas.

The most energy has been directed toward the arrangement of cylinder dimensions, igniting devices and valve gears which would be perfectly adapted to the requirements of a commercially feasible producer gas. Several such gas processes are on the market, such as the Mond, the Taylor and the Loomis-Pettibone. The Westinghouse Machine Company especially have devoted vast study to this question, and have evolved two entirely distinct types—namely, a vertical three cylinder single acting direct connected engine of horse-powers from 125 to 650, and a horizontal single cylinder double crank double acting direct connected engine of horse-powers from 250 to 1500, the latter being a twin tandem four cylinder. These types are equally used for illuminating and natural gas, changing the cylinder ratios.

The 1500 horse-power twin tandem, Figs. 1 and 2, has four impulses to each revolution, irrespective of load. The heavy base plate is a part of the water circulating system, the water passing in and out on its way to the cylinder connections. For a producer gas of 160 British thermal units the cylinders are approximately 28 x 32 inches. The engine weighs 300,000 pounds. It develops an efficiency requiring 11,500 British thermal units per brake horse-power when running at its rated capacity, and requires about 50 pounds of cooling water per brake horse-power. The engine is designed to operate at 165 revolutions per minute. For illuminating gas of 650 British thermal units the cylinders would be 25 x 32 inches.

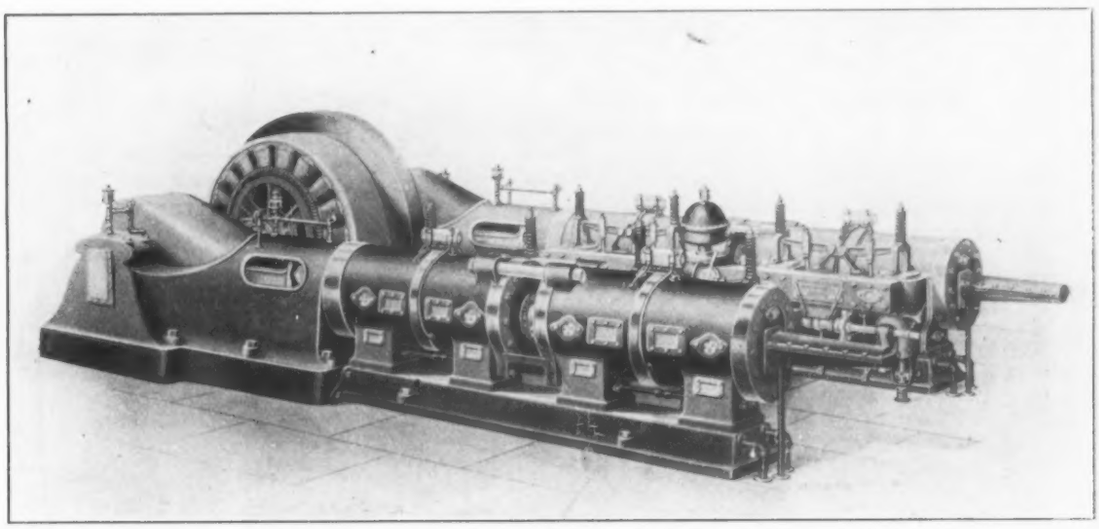


Fig. 1.—Westinghouse 1500 Horse-power Twin Tandem Gas Engine.

DEVELOPMENT OF GAS ENGINES OF LARGE UNITS.

The Westinghouse 500 horse-power tandem and 650 horse-power vertical engines are shown in Figs. 3 and 4. These engines cost about $40 per brake horse-power.

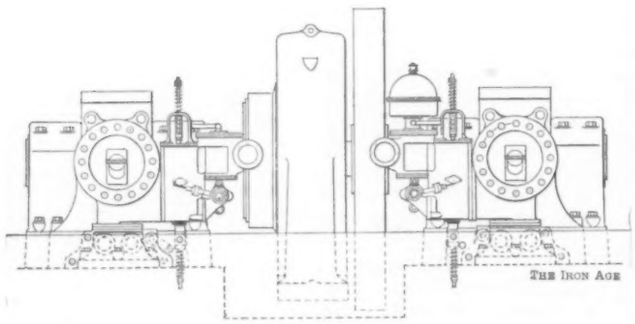
At Hillburn, N. Y., four 350 horse-power new tandem engines have been erected for central station polyphase electric lighting to run on producer gas, giving the probable equivalent of 1.25 pounds anthracite coal per brake horse-power.

Illuminating Gas.

At the beginning of this year Berlin had one gas engine for every 1300 inhabitants. A census of some of the leading American makers of engines for illuminating gas shows that for the year ending October 31, 1902, over 60,000 horse-power were sold here.

The Backus Water Motor Company of Newark have made an especial study to turn out a highly finished mechanical product, which should have a minimum of moving parts. As a result they have perfected an engine, Fig. 5, which is easily regulated and adapted for irregular work, such as coal pockets, as well as for fine knitting machinery. Their sizes run to 60 horse-power only. To introduce gas power, this company have successfully adopted the plan of leasing a complete engine and furnishing the gas for a monthly rental.

The use of illuminating gas for gas power in private electric plants, pumping plants, elevators and general manufacturing is largely on the increase, as shown by the new factories equipped by the National Meter Company, the Pierce Engine Company and many others.



During 1902 this has happily been changed. The De La Vergne Refrigerating Machine Company have begun the manufacture of Koerting gas engines, and in a few months have sold 42,000 horse-power. The Lackawanna Steel Company, Buffalo, N. Y., have ordered five 1000 horse-power engines for their electric central station. Sixteen 2000 horse-power engines have also been sold, of which 12 are for blast furnace gas. These engines are double acting two cycle, like a steam engine. The admission valves are in the valve boxes on the cylinder heads. No exhaust valves are required, as the exhaust escapes through slots cast in the middle of the cylinder and covered by the long piston. Two double acting auxiliary pumps, one each for gas and air, work together, the crank ends discharging into the crank end of the power cylinder, and the head ends into the head end of the cylinder. The pumps compress to 9 pounds per square inch, and by their mutual arrangement insure a perfect mixture of the gas. The amount of gas furnished exactly corresponds to the maximum power required,

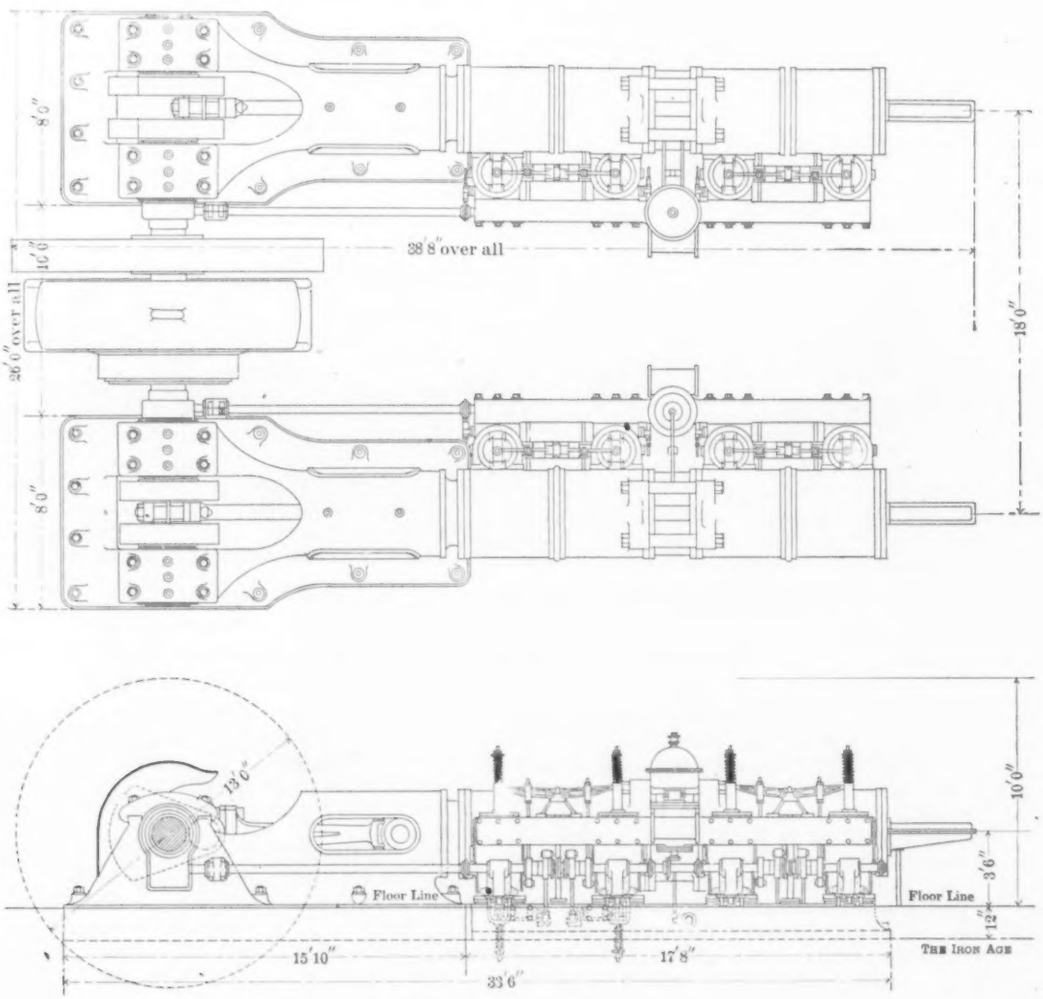


Fig. 2.—Plan and Elevations of Fig. 1.

DEVELOPMENT OF GAS ENGINES OF LARGE UNITS.

These companies inform the writer that their works are taxed to their utmost capacity.

Blast Furnace Gas.

Germany has held the undisputed lead in the development of this great and most progressing branch of gas power. In America, when blast furnace gas was utilized under the boilers of the blast furnace, a great step was made, getting from 500 to 600 cubic feet, 1 horse-power, in the boiler. Yet Germany got from 90 to 120 cubic feet a brake horse-power at the engine, long before an American engine was on the market. This is a proportion 5 to 1 in favor of a gas engine.

any diminution of load causing a later period of pump discharge. There are two spark coils at each end of the power cylinder. The time of ignition can be set while the engine is running, to meet any change in composition of the gases. Lean furnace gas requires early ignition for best effect. Blast furnace gas engines are the most formidable rivals to the best high speed compound steam engines.

Prof. E. Meyer has experimentally determined a thermal efficiency for a Koerting double acting two cycle engine of 38 per cent. A diagram of comparative efficiency is presented in Fig. 6.

The Outlook for Pig Iron.

BY JAMES A. GREEN, CINCINNATI, OHIO.

If early in January, 1902, when No. 2 foundry was selling at $11.50, f.o.b. Birmingham, any one had predicted that in September the same iron would sell at $25, he would have been regarded as pretty nearly a raving lunatic. At that time there was more than enough iron to meet all demands, but nine months later pig iron was so scarce that many great industries were crippled for lack of it. In 1901 we were exporting our surplus to Europe, and if in last January any one had said that before the year ended whole fleets of vessels would be bringing foreign iron to America, he surely would have been looked upon as absolutely daft. Yet during the last few months American ports of entry, particularly Philadelphia and Baltimore, have fairly been blockaded with steamers loaded to their full capacity with iron from England and the Rhine, or with steel from Germany. Such have been the necessities of the American iron trade that even the greyhounds of the sea, the splendid and palatial boats that constitute the Atlantic ferry, have been pressed into service and the "Lucania" and the "Campania" have included pig iron in their cargoes. In a commercial sense it has been a year of more wonders than Dryden celebrated in his "Annus Mirabilis."

If in a last January issue *The Iron Age* had even re-

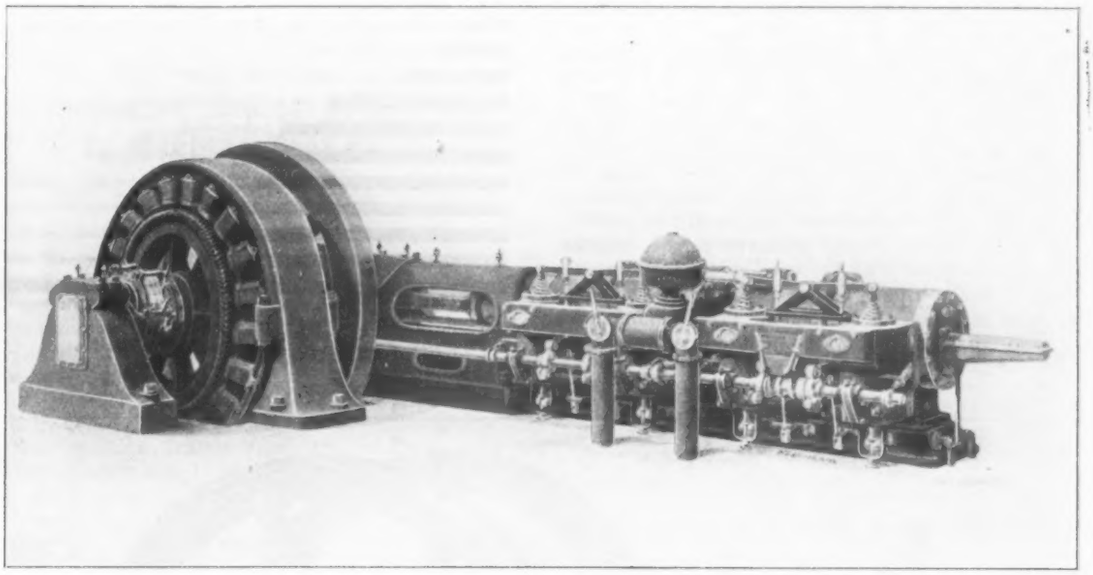


Fig. 3.—Westinghouse Tandem.

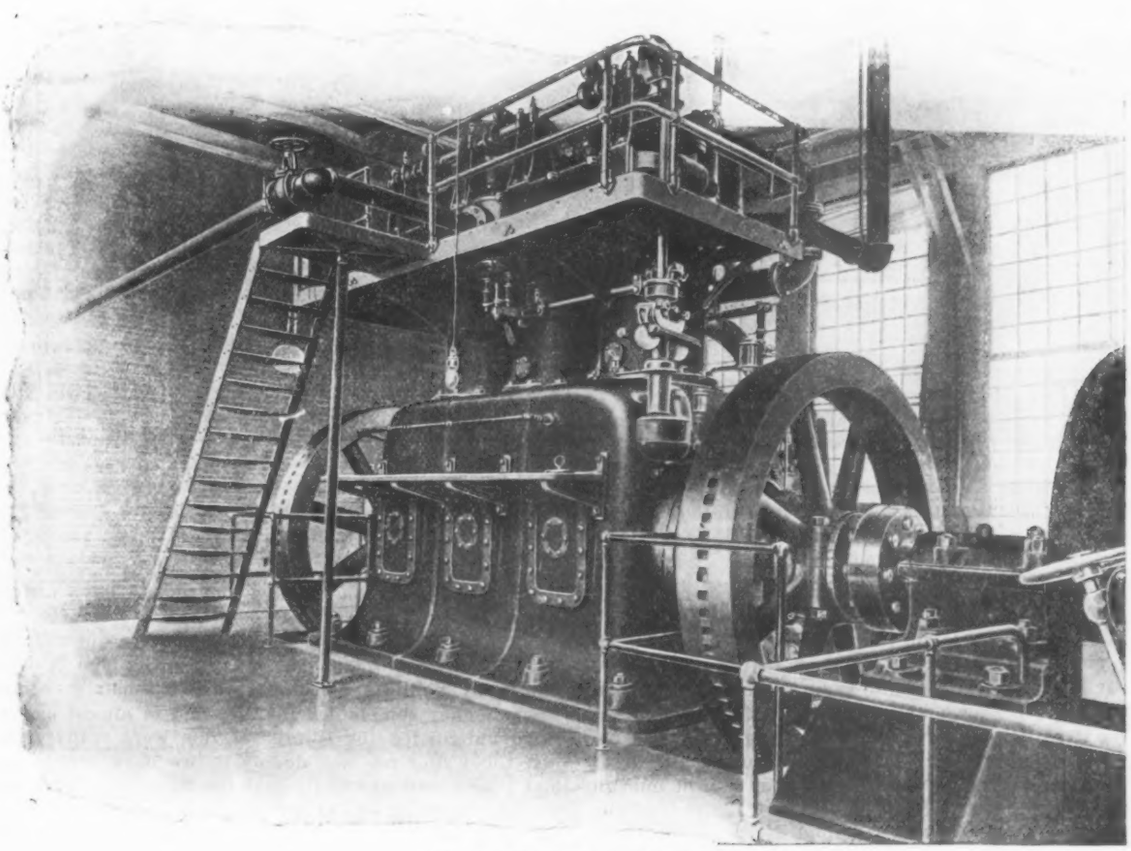


Fig. 4.—Westinghouse Vertical.

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motely suggested these things that are now so familiar it would have lost its well earned reputation as a trade journal of weight, solidity and accuracy, and would have at once been classed as fiction. With the marvelous and unexpected record of 1902 before one, it takes a bold man to venture on predictions as to the course of events in 1903. But it surely promises to be an interesting and a busy year. As far as the furnaces are concerned they are practically out of the market for the first six months. Probably never in the history of the trade have the ironmasters been sold as far ahead as they are at present. Not only is the great bulk of all the iron that is to be made between now and July 1 sold, but a heavy tonnage has been placed for the last half of the year. This assures the furnaces a prosperous year, for the iron has been all sold at high prices. By "high prices" relatively high prices are meant, for when the greatly increased cost of production is considered the margin of profit is not as great as the casual observer might imagine. Costs in 1902 jumped with the market. It is a singular fact, and of course this is an industrial law that cannot in any wise be changed, that in the great commodities prices and costs have, while not a fixed ratio, a sure relation that keeps them rising and falling in unison.

In 1902 the troubles in the manufacture and handling of pig iron overshadowed the good features, and it is not at all unlikely that these same troubles will extend over a good portion at least of 1903. If the difficulties in the situation are analyzed they will be found to have all resulted from two causes—to a shortage of labor caused either by strikes or an absolute lack of enough men to do the work, and to inability on the part of the railroads to properly move the immense tonnage of ore, coke, iron and finished materials demanded. The labor situation at the present time is in good shape and the prospects for the new year are excellent. But there seems to be but little reason to hope that the railroads can greatly improve matters soon. Many of the railroads remind me of a growing boy of 14, who tries to wear the clothes that fitted him when he was 12—the trousers do not reach much below his knees, the sleeves of the coat stop at his elbows and the vest won't button. He has outgrown his old garments. The business of the railroads has outgrown their capacity. They need more locomotives, more cars and more track room. Here in Cincinnati one of the great Southern trunk lines has scarcely had a passenger train on time for a year. The fault lies not with the operating department of the road, but the line, which is single track, is so blocked with freight from end to end that running on schedule time is impossible. This particular line, and its needs are typical, should be double tracked and should have nearly double the equipment it now possesses.

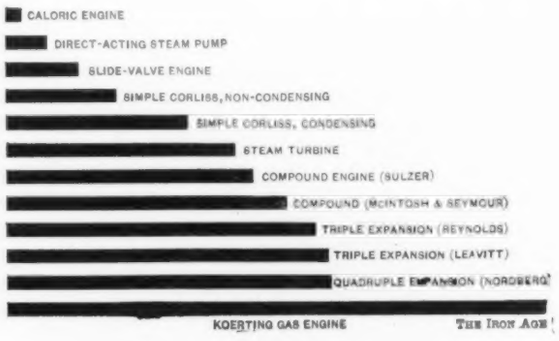

Fig. 6.—Diagram of Comparative Efficiency.

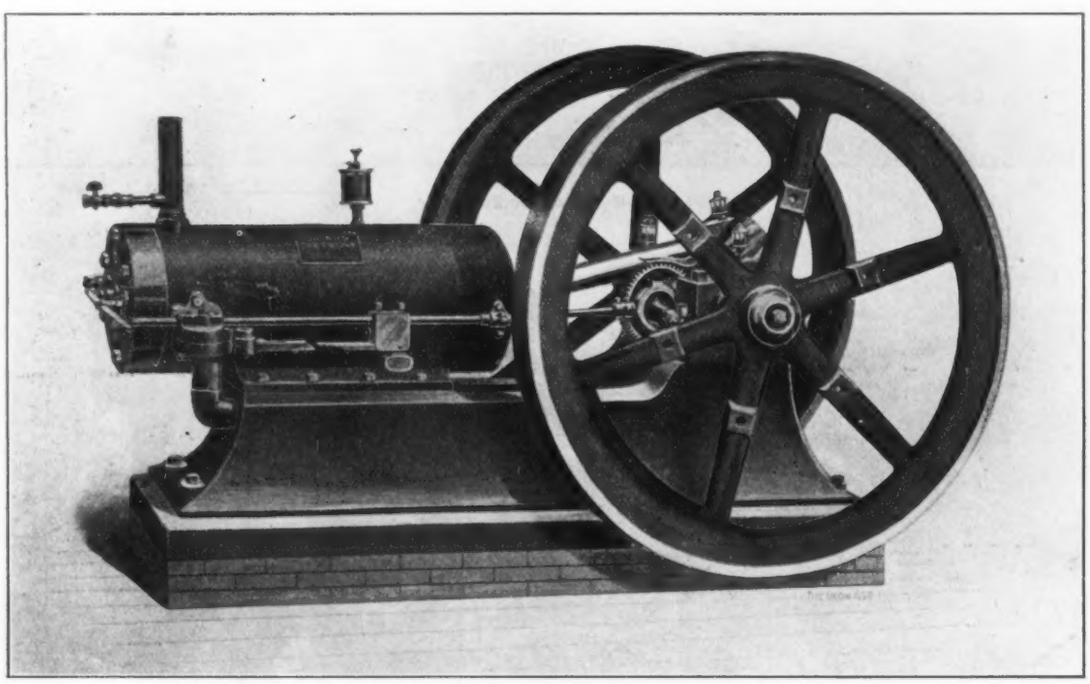

Fig. 5.—The Backus Engine.

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This brings up the wide and suggestive question of our industrial development. A few years ago it was feared by political economists that we had overdone things. They complained that we had in almost everything anticipated the future. If this were really true, and the writer for one doubts it, we have caught up and gone ahead so rapidly that the situation is now reversed. To bring the railroads and industries of America up to the demands of to-day an immense amount of work is still to be done. It is this fact that makes sure the continued prosperity of the iron trade.

Speaking in a business sense, we have in the past few years tremendously changed our mental attitude. Our imaginations have been profoundly stirred. We have become accustomed to large things; we have become accustomed to success and we have had, to paraphrase Lincoln, a new birth of enterprise. The Spanish War did more than merely demonstrate to Europe the vastness of our resources and the efficiency of our arms; it aroused in us a knowledge of our own capacities; it gave us a respect for ourselves that

we did not before possess and inspired us to new and mightier national efforts—not in the domain of warfare, but of peace. There is no thinking American man of business to-day who has not changed since the fall of Santiago. His horizons have been widened and he realizes the potentialities of the future, which were undreamed of before. There is a confidence in the destiny of America which is half the battle. This was the spirit which made so wonderful the industrial story of 1902 and which will likewise make memorable the history of 1903.

The Increased Use of Drop Forgings in Machine Tool Parts.

BY G. MILLER RUSSELL, BROOKLYN, N. Y.

"Assimilation" seems a fitting description of the aptitude of the domestic mechanic. About 1850 an alien discovered that our little Windsor, Vt., was making machinery that was invaluable in the manufacture of interchangeable army rifle parts. The Windsor business in machinery which fashioned hand smithed forgings into duplicates which might be assembled in any other place in the world thrived. Then followed quickly, too, an establishment of successful gunmakers in New England, which, about 1854 saw the need for machine forgings as helpmates to jig and fixture made rifle mechanism.

Drop forging (machine forging) is less than a half century old. Retrospectively one can find reason for a good deal of national pride in this strictly American institution. If drop forgings have helped to successfully present our strength in strife, they have more than commonly aided in our world wide establishment of prestige in the manufacture of labor saving machinery. From "the gun that was made by" to "the machine that made the gun" is not a far cry.

Of an estimated 25,000 tons, total annual home consumption of soft or machinery steel in the making of drop forgings, possibly 10 per cent. enters the form of machine tool parts. Within ten years, however, this relatively small tonnage has become an all important sales factor. The desirability of American made machine tools throughout the world is history. Moreover our tools are specifically sought after by foreign builders as models of design, precision and utility in machine creation.

Design and minimum weight are of vast general importance in the increased use of forged parts. Infinitely greater, however, is the value of their wearing qualities. Contrasted with castings this feature will induce further incursion upon machine tool premises. Soft steels may be case hardened. Steels of carbons from 0.10 to 0.70 per cent. are readily forged, and may be adapted to a variety of tool builders' purposes. Specifications from the "ever onward" maker for the higher carbon Bessemer or open hearth steels are becoming frequent, as their efficiency may be determined. At one time one of our largest builders of machine tools considered the drop forging of "tool" steels for machine parts as impracticable. "Burned steel" and "unequal refinement (stress)," &c., were the bugbears. These, with care in forging, box annealing and pyrometer measure in tempering, have been overcome, and to-day tons of crucible steels enter into the more intricate, wear bearing tool parts.

An astonishing amount of bias once existed because of the alleged prohibitive first cost of drop forgings. Increased skill in their manufacture leveled their cost and forced recognition of their value because of the small amount of labor and machinery required to wholly fit them for use. Drop forgings, "gauge struck," are now almost common, and product with a variation of but a "few thousandths" is practicable. When (commensurate with size) design, utility and wear are considerations, drop forgings should reasonably commend themselves and add to the "asset" value of machine tools generally.

Drop forgings particularly lend themselves to the designer's application of eye pleasing shapes. A few years ago machine handles or crank handles were rather clumsy combinations of several castings of excessive weight, yet scant in strength. Subject to constant hard service and abuse from shop aisle traffic these among the first were succeeded by modern, graceful, strong, one piece forgings. Noticeably it has found favor among foreign manufacturers. Milling machines particularly have been parental in their adoption of forged mechanism. Levers, lever locks, arbors, dogs, gears, index parts and other items of individuality mark the course of eminent builders. Here, too, are found, as working associates, the finest examples of drop forged wrenches, spanners, &c. Foreigners never before appreciated the value of extremely fine finish and excellence of design accorded these simple "extras."

On desirable planers one can trace the reasonable adoption of forged bar tighteners, fingers, tee bolts, dogs, latches, &c. The lathe further incorporates a goodly number of forgings remembered readily in the tool post and parts, latch handle and gears. The box tool in automatic screw machines is another case of good practice. More or less place is made for the wrought part product in the grinding machine, shaper and drill, and reasonably may be expected to look after themselves.

The rapid increase in use of drop forgings in machine tool parts is only eclipsed in quantity by their remarkable consumption in labor saving and manufacturing machinery.

The Unit System of the Baldwin Works.

In the *Annals of the American Academy of Political Science*, John W. Converse describes in a very interesting manner the unit system at the Baldwin Locomotive Works, of which he is the head. We select from the memoir the following passages:

The capacity of the establishment is 30 locomotives a week. Orders are allotted spaces in the week in which delivery is promised. If a new design has to be made, the drawing must be completed and data submitted to the purchasing department for ordering material at least a month before the work is to go to the shop. All parts of locomotives and tenders, except boiler and tank plates, steel tires and steel castings, chilled wheels, boiler tubes and special patented appliances, are made from the raw materials. All raw materials and all parts ordered by the purchasing department are ordered for a definite locomotive or a number of locomotives of a particular class and must be invoiced as such.

The foreman of each shop where the various component parts of the locomotive are made is furnished a list, bearing the class designation of the locomotives for which the parts made in his shop are intended. When the drawings are furnished him he allots the work and sees to it that it is finished by the time specified on the list. Each part is marked with the class designation of the locomotive for which it is intended. Each workman reports to the timekeeper through his boss or through the foreman his time for each piece and the locomotive for which the piece was intended. All these component parts are assembled in the erecting shop at the appointed time, and, by means of this unit system, the finished locomotive is put together without confusion or unnecessary delay.

A further advantage of this unit system of production appears in the accounting department. Two sets of books are kept—a financial and a manufacturing set. In the financial department accounts are kept of sales, purchases and expenditures. In the manufacturing books a separate account is opened with each locomotive, and the material entering into its construction and the labor expended on it are charged against that locomotive. At the end of the year these two sets of books must balance each other. By this method the actual cost of each locomotive is obtained with accuracy and, allowing for fluctuations in price of raw materials, correct quotations can be made for any class of engine.

It is upon this unit system of locomotive classification, by means of which the identity of each locomotive is preserved, that the system of the labor organization and the management of the establishment is based.

The Chicago Iron Trade in 1902.

BY W. T. PARTRIDGE, CHICAGO, ILL.

In many respects the year 1902 has been without parallel in the history of the iron and steel industry in the United States, and has added another period of 12 months to the cycle of activity that began with the advent of 1898.

In the annals of the trade 1902 will ever stand conspicuous for vitality and strength of the domestic markets; for highest records of production and consumption; for general prosperity, with all its attendant blessings and evils—for it has both; for magnitude of transactions, and for the adoption beyond precedent of efficient economical devices in manufacturing.

We have become so accustomed to using superlatives to express the breaking of records from month to month that the vocabulary seems barren when the year's developments are viewed as a whole. But we should not be unmindful of the fact that recent happenings are ever magnified by close proximity and it is only when seen in perspective that events assume their normal relative proportions, presenting a more harmonious picture with richer coloring.

It has been contended that little profit can be derived from marshaling the ghosts of the past, but it is only by reviewing history that we are able to make deductions as a guide for future movements and to determine probabilities.

The events of 1902, so far as they pertain to iron and steel, have demonstrated what may be accomplished by the aggregation of large capital controlled by rare judgment and executive ability. Ever since the dim days of early commerce there has been an effort to discover the underlying laws of fluctuations, the rise and fall of prices, and the ebb and flow of trade currents, but not until the present generation has there been a serious effort to control such movements on a large scale, bringing about what may be called steady markets. Most efforts of this kind have met with disaster, and an absolute control may be classed among the impossibilities. But there seems to be no reason why the natural tendency to rise and fall should not be controlled within special definite limits, thus modifying the disastrous effects of both booms and depressions. This seemingly has been the policy adopted by the United States Steel Corporation. But what may have been accomplished during a year of unprecedented consumption may be found difficult of attainment when opposite conditions prevail.

A "Boom" Averted.

Reviewing the events of the year in detail the conviction is forced that, had it not been for the tremendous influence exerted by the largest interest in the market, much higher prices would have prevailed for intermediate and finished products of steel; in fact, that a veritable "boom" would have visited the trade during the year, and, as action and reaction are equal and opposite, this would have meant an equal depression some time in the future. It would seem, then, that thus far the predominating influence of the great corporation has been of a beneficent character. But every picture has its light and shade, and it must not be lost sight of that those interests in the iron and steel industry not self contained—those not having recourse to resources within their own control for obtaining raw materials—have suffered from the narrow margin between raw materials and the finished products, not only reducing the profit, but in some instances even entailing a loss. For such interests the year 1902 has not been, as to the majority, one of unprecedented prosperity.

A study of the pig iron situation reveals the general trend which would have prevailed throughout the steel industry without the exercise of restraint of powerful influences, as it is in the pig iron market alone where natural tendencies have had full sway. An effort was made, however, both in the North and the South, to keep a steady market in the pig metal, and had this endeavor been successful the smaller interests might have had a more profitable year.

Outlook for 1903.

Interest now centers in the outlook for 1903, and, as throwing some light on the situation, the conditions of the largest producers are of advantage:

About two-thirds of the capacity of the steel rail mills of the country has been sold for 1903, the local mill having orders booked even into December of 1903; plate mills are sold into July; structural mills have sold their product for four to six months—except on large sizes—and even for the lighter finished products considerable capacity has been sold for 1903. A very large tonnage of pig iron, too, has been sold for the first half of 1903 and not a few contracts of moment have been placed running into the third and fourth quarters of the year.

On the other hand there is a great deal of new capacity for all classes of material, from raw material to finished products, which will come into active service during 1903, and many of the mills which are largely sold ahead have been increasing output to a great extent, making considerable headway in catching up with the great mass of accumulated orders.

One of the most conspicuous features of the year has been the difficulty in the production of an ample supply of fuel and in the distribution of both raw and finished products by the railroads. There is scarcely an interest in the iron and steel industry that has not felt the baneful influence resulting from the deficiency in motive power of the railroads and inadequate supply of cars to move freight. Had it not been for these drawbacks the output of domestic pig iron during the year would probably have averaged 1,600,000 tons per month, which would have cut off the necessity of importations of pig metal.

The conclusion to be drawn from these facts is that 1903 will be full of activity and business, probably remunerative, generally speaking, above the average. But if there is anything in the law of periodicity and of cycles, the iron industry has passed the noon of the present period of animation.

New Enterprises Developed.

Nineteen hundred and two has been prolific of new enterprises in the iron and steel industry. As a rule, the various companies incorporated in the West have been of minor importance from the standpoint of capital invested, but in the aggregate the amount has been considerable. To a large extent the energy put into industrial plants has taken the direction of strengthening existing works by construction of new buildings, foundries, mills, machine shops, by the increase of open hearth and blast furnace capacity and the installation of many new machine tools in the various plants which have been in existence for some years.

The movement toward consolidation of plants and the concentration of important interests has continued throughout the year, but to a less extent than during the three immediately preceding years. It seemed to have been accepted as an unwritten law that the United States Steel Corporation would make no further acquisition of active competitive properties, but in the light of recent experience it is hazardous to make predictions. It is known that the corporation has been in sad need of additional blast furnace and open hearth capacity, which will be obtained through the recent acquirement of the Union Steel Company properties, and while this purchase may somewhat modify the plans of the corporation at other points, it does not change the complexion of affairs at Chicago.

Illinois Steel Company Expansion.

For months past the Illinois Steel Company have been remodeling furnaces 4, 5, 6 and 8 at South Chicago, and when the work is completed the output of pig iron will be largely increased. Recently three furnaces have been out of blast, but two of the stacks will be idle only temporarily. Scarcity of coke has been the cause, the shortage in fuel supply being felt by the constituent companies of the United States Steel Corporation in common with the merchant furnaces in this section. In addition to the increased output of the blast furnaces it is understood that plans have been prepared for a material increase in open hearth capacity, and improvements and even new construction which will give additional output of plates. It is also understood that a structural mill will be erected at South Chicago, and it is contemplated to begin work in the spring of 1903. One of the most radical and important improvements at South Chicago during the year has been the installation of the ore handling system to which reference has been made in *The Iron Age*. It is claimed that the saving by this work alone will pay for the cost of construction within a few years. A number of improvements will also be made at Joliet, bringing up that plant more on a level with the efficiency now attained at the South Chicago works. Between $1,000,000 and $2,000,000 were expended at Chicago during the past year in construction and improvements and the plans now contemplated will call for the expenditure of several millions more.

The Steel Plant of the Harvester Company.

Another important industry located at South Chicago which will be completed in 1903 is the steel plant of the International Harvester Company, and for the first time we are able to make an official announcement. As is known to the trade, the entire plant was originally planned and the work commenced by the Deering Harvester Company and the work is now being completed and will be operated by the International Harvester Company. It is expected that the plant will be in operation by April 1. The steel plant is located at 106th street and Torrence avenue on the Calumet River. One blast furnace with an annual capacity of 80,000 tons of pig iron is already in operation, and a second furnace is under construction which will be finished in the spring of 1903 with an annual capacity of 120,000 tons of pig iron. Mesaba ores from the mines originally purchased by the Deering Harvester Company will be used. It is estimated that the supply from the mines will be ample for the needs of the International Company for 30 years or more. Coke will be supplied from the coal lands in Eastern Kentucky which were also acquired through the Deering Harvester Company. The pig iron will be converted into steel by the Bessemer process in a two-converter plant of modern design of sufficient capacity to meet the present and future needs of the International Company, and with slight additions could be increased to produce a much larger quantity of ingots. The blooming mill is of the modern reversing type built by Mackintosh, Hemphill & Co. of Pittsburgh. Ingots will be rolled into 4-inch billets, the mill having a capacity of over 200,000 tons of finished billets annually. The bar mill is of the continuous type built by the Morgan Construction Company of Worcester, Mass., and will be equipped with modern machinery for the economical production of bars and shapes. The bars are to be cut to exact lengths required in the manufacture of machines and will be distributed to the various plants of the International Company. The capacity of the finishing mill is over 60,000 tons of finished product annually. In addition, large malleable and gray iron foundries using molten pig iron are contemplated. It is probable that other mills will be built and also extensive factories for manufacturing various articles of steel, including bolts, rake teeth, &c., that are largely used in the manufacture of agricultural machines.

The Inland Steel Company Plant.

The Inland Steel Company, who have been building an open hearth steel plant at Indiana Harbor, Ind., began rolling billets during the summer, and in the fall made quite considerable shipments of finished products. The plant will not be fully completed until some time this month. The works consist of four 50-ton furnaces, a blooming mill, a bar mill and a sheet mill. The daily output of finished steel is from 400 to 500 tons.

Construction at Grand Crossing.

The Grand Crossing Tack Company, who have been rolling wire rods and drawing wire, as well as turning out wire nails and other finished products, at Grand Crossing, have been building an open hearth steel plant and rolling mill. The complete plans embrace the construction of 12 buildings having an aggregate floor space of 70,000 square feet. The main building is designed to be 440 feet long by 60 feet wide.

Consolidations and Mergers.

The organization of the Chicago Pneumatic Tool Company, who were incorporated late in December, 1901, was perfected during 1902. In February the company absorbed the Standard Pneumatic Tool Company of Aurora, Ill., and in the spring secured control of the International Pneumatic Tool Company of London. In September the merging of two English plants manufacturing pneumatic tools was accomplished by J. W. Duntley, president of the Chicago Pneumatic Tool Company, under the name of the Consolidated Tool Company, all the stock of the English companies being owned by the Chicago Pneumatic Tool Company.

In January the Detroit Bridge & Iron Company of Detroit, Mich., were purchased by the American Bridge Company.

Among other consolidations affecting local plants has been the American Brake Shoe & Foundry Company, who were the consolidation of the Ramapo Foundry Company of Ramapo, N. J., the foundry department of the Sargent Company, Chicago, and others.

Early in the spring an attempt was made to consolidate the various manufacturers of cranes, but the project was not carried to a successful issue.

In May was organized the American Steel Foundries with a capital stock of $40,000,000, into which was merged the Sargent Company, Chicago.

Late in May the Railway Steel Spring Company of Pittsburgh absorbed the Steel Tired Wheel Company, the capital stock of the Spring Company being increased from $20,000,000 to $27,000,000. The Steel Tired Wheel Company had works at Chicago.

In August the trade was much interested in the organization of the United States Realty & Construction Company, with a capital stock of $66,000,000, which consolidated the interests of the George A. Fuller Company, the New York Realty Corporation and the Central Realty Bond & Trust Company.

During the latter part of August the American Rolling Mill Corporation purchased the works of the Continental Chain Company located at East Chicago.

Among the locomotive and car works that were obliged to increase their capacity was the Hicks Locomotive & Car Works at Chicago Heights. Details of the new constructions have already been given.

During the summer an effort was made to consolidate many of the malleable foundries in the Central West, among them being one or two of the local plants. Progress made in this consolidation has been referred to frequently. The last meeting was held at the Auditorium Hotel, Chicago, at which time developments were made not entirely favorable to the early consummation of the plan. It was expected that the first of the year would see the new company well started and there is still hope entertained that all details may be accomplished early in the year. The capital stock, however, will be less than originally contemplated, being now placed at $10,000,000. It is asserted that either a Buffalo or Detroit founder will be elected to the presidency.

The endeavor to consolidate the interests of the bar iron mills in the Central West is referred to under the heading of Bar Iron.

The Machinery Industry.

It may be estimated that the volume of business in the machinery industry in this section during 1902 has increased from 25 to 50 per cent. over the business transacted in 1901, and the outlook for continued activity, even to the running of many plants at high pressure night and day, is bright for 1903. Each succeeding month during the year seemed to show an increase over the preceding month, until the third quarter of the year, when the culminating point was reached in September, and in some instances a month later. There was scarcely a month but that some branch of the industry was overwhelmed with orders, and at the present time large producers have contracts booked for various deliveries of 1903, in some cases extending forward ten months. There is scarcely a concern that has been in business for any appreciable length of time that has not broken all previous records in the volume of transactions, and in many cases in the profits secured from the business. This includes agents as well as manufacturers. The continued building of new foundries, machine shops and other additions to existing plants and the constant adding of new equipment to increase capacity bear evidence to the statements made. Manufacturers of power transmission machinery; of engines, boilers and pumps; of mining and milling machinery; of machine tools, heavy, light and pneumatic, have all shared to a liberal degree in the heavy orders placed. Repair shops and supply houses have also reaped a rich harvest. If one industry may be named above another, the manufacturers of locomotives and other railroad equipment might be said to have been more generously supplied with contracts which will carry them through the entire year of 1903, arising from the phenomenal amount of business derived from railroads compelled to increase facilities to handle the enormous traffic both present and prospective.

Pig Iron. 1902.

Throughout the year the various causes conspiring to influence the course of the pig iron market have been of unusual importance and of no little interest even to those outside of the iron trade. The year opened with the general feeling confident of a prosperous year, and in some respects the unusual character of the market had been foreshadowed, but there were few who realized that wewere on the threshold of a production of 1,500,000 tons per month. If they had, a less confident tone might have prevailed. Yet it is as a year of unparalleled consumption rather than of production that 1902 has been conspicuous. Not only have upward of 18,000,000 tons of domestic pig been melted, but we have imported on an average upward of 40,000 tons of foreign pig iron per month. It is interesting to note that conservative distributers of pig iron in the West estimate that the consumption of domestic and foreign pig in this section of the country--west of the State of Ohio, east of the Rocky Mountains and north of the Ohio River—has been not less than 3,000,000 tons during 1902.

The year opened with a railroad embargo on raw material of all kinds, but especially upon coke, and furnaces were being banked right and left throughout the country, 12 stacks being idle in the local district with a prospect of more furnaces being compelled to blow out. Such conditions prevailed more or less throughout the year. During the last month of the year, however, the heroic efforts made by the railroad companies relieved to a considerable extent the pressure on local furnaces and foundries and in some respects the situation now is a little improved over the condition existing a year ago; but, as was pointed out 12 months ago, the same elements which interfered with the production of pig cut down consumption in nearly the same proportion.

As far as prices are concerned, there is a radical change from a year ago. In January, 1902, the market was strong--could hardly have been more so—and prices were hardening daily; to-day, although prices have receded somewhat from the highest point, they are, on foundry grades, from $7.50 to $8 per ton higher. Even on forge iron there has been an advance of $5 per ton. Car wheel iron has risen from $9.65 to $10.15 per ton, while high silicon iron is on a level from $12 to $13 per ton above the prices current on January 1 last year. It is to be noted that these comparisons are on iron for quick shipment, but even on iron for forward delivery there has been an advance of $8 per ton.

Last year, as now, malleable iron founders were having much difficulty in obtaining ample supplies of either standard or malleable Bessemer and were contracting largely for charcoal brands. This year the product of the charcoal furnaces is so closely sold that there is very little available, and founders are turning more and more to foreign iron.

A Vigorous Buying Movement.

About the middle of January there was a vigorous buying movement in progress, large contracts covering the first half of the year being placed. As early as the third week in the month interest was centered in the third and fourth quarters of the year, some heavy transactions being made for the third quarter in the Chicago district, car wheel manufacturers being the most conspicuous buyers. These facts are peculiarly interesting now, as the selling interest anticipate a repetition of these conditions in January, 1903. It is notable that iron for quick shipment was even then difficult of attainment, but the situation began to be somewhat relieved through the more ample supply of coke, the 12 furnaces which were banked on the first of the month having been enabled to resume active operations. The railroad companies, too, were giving better service. But the situation respecting foundry iron was unusual, the demand for iron for steel manufacture limiting sharply the tonnage produced for foundry and malleable grades.

Toward the latter part of January the leading Southern producers were pronounced and emphatic in their determination to prevent any further rise in the market —at least for Southern pig—it being claimed that $12 for No. 2 foundry at Birmingham was adequately remunerative and that checking an advance to a higher level would be to the interest of the trade in general. But this announcement apparently had little effect on consumers, the rush to cover almost forcing an upward movement irrespective of the furnaces.

While affecting the local market only indirectly, there was much interest manifested at this time in the effort to establish a price on non-Bessemer ores for the coming season, the independent mines asking the leading ore interest to agree to purchase 1,500,000 tons, which was refused because the leading interest proposed to mine all the ore required for its smelting operations. This is significant now in showing the early formulation of plans since put effectively into practice. The result of the negotiations at that time among the ore companies was that there was no agreement as to price on non-Bessemer ores or as to tonnage. On Bessemer ore, however, prices were established at $4.25, Cleveland.

Early in February there was evidence that the greater part of the tonnage for the first six months of the year had been taken up, the phenomenal demand then dealing with the tonnage for the second half of the year, some round lots for basic pig being placed in the Chicago market. Car wheel works were especially active buyers for charcoal brands, a large share of the tonnage being placed with Southern furnaces.

An interesting feature was that at this time there was some talk of bringing back American foundry ir which had been sold to Europe during the preceding year. But this later proved to be rather of a sensational nature, as stocks of such iron abroad were proved to be insignificant. The enormous consumption of iron was early reflected in the statistics, melting in January reaching probably 1,500,000 tons, while the furnace returns showed a production of 1,456,642 tons. About the middle of February the usual winter storms threw the whole transportation system out of gear, resulting in trouble to furnaces and foundries alike through the interruption of the coke supply, and in some sections furnaces were again forced to bank; and although cars were reported in more ample supply, deliveries of all material were unsatisfactory. Difficulties to the productive end,

however, seemed only to whet the appetite of melters and large blocks of iron, especially of malleable grades, were sold at Chicago.

Efforts Against a Rise.

Toward the latter part of the month of February an interesting phase was developed in the foundry iron department of the market. The strong Southern companies, who had previously determined to hold the market steady at the $12 level reiterated their position, fortified by strong statistics, but they were opposed by a few Southern makers and Northern producers who acted on the belief that a further advance was justified by the conditions prevailing. Their position received moral support from the placing of 100,000 tons standard Bessemer at an advance of 25 cents per ton by the United States Steel Corporation. The large Southern interest which was against the advance had the courage of its conviction and accepted a very large tonnage for the second half of the year, it being reported that fully 200,000 tons of foundry iron were sold in a single week. This did not prevent the placing of large orders for Northern irons at an advance of $1 per ton, which seemed to have no effect in discouraging consumers. Great pressure was brought upon furnaces to anticipate shipments, and it was discovered that malleable founders, notwithstanding heavy purchases, had not fully covered for the first half of the year. Heavy buying of foundry iron continued throughout the second month of the year, but this was followed by a lull during which the serious lack of cars for prompt shipment became again a prominent feature, and floods and storms again interfered with fuel production at a time when a delay was most annoying. To some the anxiety respecting an ample supply of foundry iron for the second half of the year was allayed somewhat by the Southern interest referred to. But this more general feeling did not prevent some important interests from placing large orders, conspicuous among buyers being pipe founders, locomotive works and car builders. As indicating the situation as far as Southern producers is concerned, it was asserted that on March 1 over 800,000 tons of foundry iron had been booked, leaving about 300,000 tons available for the balance of 1902. In addition it was estimated that the blowing-in of remodeled and new furnaces would give an additional supply of 175,000 tons, which would become available during the last half of the year. The blast furnace statistics for the month of February reflected the conditions experienced by producers in various parts of the country arising from the disturbed transportation and consequent scarcity of fuel. The actual production during February was estimated at 1,285,819 tons, being from 75,000 to 100,000 tons under the normal supply. Under such circumstances it was not surprising that stocks both in furnace and foundry yards should have declined materially, the surplus at that time being estimated at only 100,000 tons in the yards of merchant furnaces. As the month of March proceeded, the scarcity of metal was more keenly felt and buyers were forced to pay several dollars premium for immediate delivery iron. As was pointed out then—and may be well to recall now—of the whole tonnage of iron going into the cupola, converter and open hearth furnace, a very small percentage was purchased at the higher prices then prevailing, the great mass of metal, it being noted, being received on previous contracts at much lower prices.

More Large Contracts Placed.

For a short time there seemed to be a revival again in the Chicago district of the heavy buying movement of the month previous, malleable iron purchasers buying liberally for the second half of the year, the tonnage reaching between 75,000 and 100,000 tons in one week. It is notable too that these contracts were placed in direct opposition to the views of the furnacemen, the producers reassuring their customers that no anxiety need be felt concerning the supply of malleable Bessemer after July, 1902. To some extent these facts allayed the anxiety of some buyers, but others were importunate, resulting in the placing of the contracts above stated. Looking back on the situation from our present standpoint it is evident that the furnacemen were sincere and were especially desirous of preventing any movement which should tend toward speculation, and their position seems to have been well taken, for at least one large melter seemed to have purchased considerably beyond necessities to cover contracts for castings, and this was reflected in the request for delay of deliveries. This must be regarded as exceptional, however, as the whole tendency was in the other direction; and, as we now know, legitimate buyers purchased scarcely anything beyond their requirements, but this was due largely to the fact that requirements proved much more liberal than was anticipated early in the season.

The Beginning of Importations.

It is notable, too, that at this time small lots of Scotch pig were being purchased for importation, and it was not very many weeks later that buyers even in the Central West were receiving small consignments of foreign metal, although the general buying movement did not begin until several months later. It is also known that foreign iron was supplied to consumers in the Chicago district about this time, the iron being sold on its merits by analysis and not as foreign metal at that time. Such a movement although small was significant at that time, and was a natural outcome of the enormous consumption which overbalanced production to a considerable extent.

It is small wonder that fears were still entertained that we were about to experience a runaway market on pig iron, and these views were even held by the most conservative members of the trade. It was feared, too, that a rapid advance might check consumption, induce reselling and lead to the inevitable reaction which was to be more feared than the higher prices. These views were substantiated, for there were occasional resales of iron by consumers who seemed to have purchased more than requirements called for and were desirous of reaping a profit brought about by the premiums prevailing for spot iron. This movement was more especially noticeable in Bessemer pig, a few large consumers making excessive purchases. With evidences of resales, it is not strange that the Southern producers of foundry iron should again have thrown their weight against an advance in the official market, notwithstanding that on the other hand there was undisputed evidence of a strong and even buoyant undertone. Northern furnaces, with a minority of the Southern producers, however, were not held in check by this unusual Southern conservative spirit, and advanced prices 50 cents per ton. The struggle to hold prices down was continued into the month of April, but the market gathered strength continually and gradually passed from the control of the conservative element. The leading interest and largest consumers of Bessemer iron continued to give their powerful support to the policy against higher prices, and this was prompted apparently for the good of the entire industry, being the result of a far-seeing policy, for the immediate result due to the existing prices on the sliding scale would have compensated this interest for any actual advance which might necessarily be paid for pig.

Labor Clouds.

At this time small clouds seemed to be gathering on the horizon incidental to the restlessness on the part of labor. The immediate effect seemed to be confined to the Eastern territory, but it was not without moral influence in the West, and manufacturers were looking with some mistrust upon the result of the attitude of furnace labor which had been taken some months previous respecting an eight-hour day to be effective May 1. Even a slight hitch at the producing end of the market would throw the machinery out of gear, and considerable business might be lost through even the slight checking of the enormous consumption then flowing.

Early in the month of April the negotiations which had been pending between the United States Steel Corporation and the Bessemer Association culminated in the purchase of 200,000 tons of standard Bessemer for the fourth quarter of the year and even for the first

quarter of 1903 at $16.50 at the furnace, the corporation reluctantly yielding to the advance in prices and also making a concession in the extension of delivery into 1903. Even the great influence of the powerful corporation, in conjunction with the efforts of the leading blast furnaces in the South, was unable to withstand the tremendous pressure of natural forces backed by the self interest of independent companies. And it is noted that the less powerful interests were obliged to pay premiums of from $1 to $2 per ton over the official basis.

A Lull in the Market.

Toward the middle of April there was again a lull in the pig iron market, the principal buyers having covered their probable requirements far into the future. The lull again brought to the surface some attempt to resell and some requests for delayed deliveries, but these instances were of a sporadic nature by no means indicative of the general situation. With prices $2 to $3 above official prices, the markets were sounded for Bessemer pig, but prices asked discouraged such a movement at that time.

Toward the latter part of April it is worthy of note that the car supply for the first time in many months was pronounced nearly normal, and in consequence deliveries of both crude and finished material were improved. There was little new buying of pig at this time, consumers being more concerned with obtaining deliveries of material already purchased than to further extending their lines. It is notable also that some far seeing consumers were deeply impressed with the situation and made overtures to the furnaces for the purchase of iron for 1903 delivery at the "official" prices. The producing element, however, seemed to realize the true situation better and demurred or turned down any such overtures. All indications were that consumption was running heavy at flood tide, with no indication toward a reaction, and, as usual at this time, the attention of the entire trade was turned toward the crop outlook and the financial situation. The attitude of labor, too, was keenly watched, there being further evidence of a restlessness in the ranks and a desire on the part of workmen to more fully share the widespread prosperity. The official quotations were now fully discredited, premiums for prompt delivery being the rule. Surrounded by such unusual and important conditions, the trade naturally looked toward the forecasting of the future, and it was pointed out at this time that a considerable part of the heavy tonnage under which the furnaces, foundries and mills were groaning was largely due to improvements and extensions of the iron works themselves and with these additions completed, with the demand falling off, as was naturally expected, the increased productive capacity would turn the balance in the opposite direction. But now, on the first of the year, after the lapse of eight months, we are only beginning to see the result, so continuous and heavy has been the consumptive movement. The momentum derived from such velocity and mass seems likely to carry us for many months to come at a high speed, although at a reduced and gradually declining pressure. With the advent of May Day the atmosphere was somewhat cleared through the averting, at least temporarily, of the labor trouble at the blast furnaces, and also through the improved conditions in the transportation of ore and fuel. As furnace statistics became available in May, it was found that during the month of April the furnaces had reached the enormous output of 1,503,326 tons, it being the first time in the history of the industry that production had reached such a high point. For several weeks the market continued very strong but without special activity, and toward the middle of May scarcity again developed in raw material, especially in the East, resulting in the closing down of many mills and suspension by founders. It is interesting to note that at this time the Chicago territory was very well supplied with coke, and that shipments intended for this section were diverted to the relief of stringent conditions in the East.

The Anthracite Miners' Strike.

About the middle of May more perplexing conditions developed, not least among them being the strike of the anthracite miners, which interfered with the pig iron supply in the East and indirectly had its influence in the West, although it was several weeks in developing, the foundries growing shorter and shorter of reserve metal. The Southern furnaces, who had determined to market the remainder of available iron for the last quarter of the year, found a less ready market than they had anticipated, apparently only about one-third of the tonnage offered being quickly taken on the basis of $15.50 to $16, Birmingham. While the local market remained quiet during the remainder of the month of May, negotiations and purchases by the United States Steel Corporation attracted considerable attention in the Central West, it being reported that they had purchased 50,000 tons of Southern basic and were negotiating for further large tonnage of Bessemer extending into the second quarter of 1903. The trade was still unsettled through sympathy with the influence exerted by the anthracite coal miners' strike, but there was some relief through the announcement that the blast furnace workers in Ohio and Western Pennsylvania would not strike on June 1 as had been feared, and this was fortified by the news that the strike in Mahoning and Shenango Valleys, which had temporarily crippled 20 blast furnaces, had failed. The record of the blast furnaces for the month of May showed a production of 1,571,973 tons, this being the highest record of any month during 1902, and this production was attained in the face of many and harassing difficulties.

Large Buyers in the Market.

Early in June it is notable that some large buyers, prominent among them being agricultural implement manufacturers, were in the Chicago market for foundry iron, the deliveries extending into the first six months of 1903. The majority of iron melters, however, were disposed to wait further developments. The scarcity in the immediately available supply of pig iron was a prominent feature throughout the country in June, and both consumers and producers were further harassed by the occurrences of strikes in the coal sections of West Virginia, from which the Ohio Valley furnaces were suffering, as well as in the anthracite regions. The inquiries for pig iron for 1903 delivery became more general as the month advanced, but the prices asked by producers being close to those current for spot checked or rather postponed the buying movement. Prices for prompt delivery iron continued to advance. During the last week in June one of the largest producers opened their books for the first six months of 1903 on the basis of $16.50, Birmingham, resulting in the sale of some heavy tonnage. Local producers took similar action, resulting in a fair number of orders. The difficulty of obtaining fuel and the agitation in labor conspired against bringing the full productive capacity of the country to the surface, and these facts were reflected in the statistics for that month—June—the total production being 1,479,456 tons.

Heavy Buying Movement.

During the month of July a heavy buying movement in foundry pig set in, some very large contracts being placed with both Northern and Southern furnaces for the first half of 1903. During one week sales reached an aggregate of 160,000 tons. The scarcity and high prices paid for spot iron afforded a most excellent opportunity for importers of foreign foundry pig iron and considerable sales of Scotch, English and German brands were reported during the month.

Early in July Southern railroads warned producers that they would protect them on freight rates up to January 1, 1903, only, the result being that the responsibility for higher freight rates for 1903 was shifted from producers to consumers.

It is remarkable that nearly all the troubles in the pig iron market experienced up to the middle of July had been visited in large measure upon the makers of foundry iron, putting buyers dependent upon this class of iron in serious difficulty, the scarcity of iron available for steel manufacture being relatively light up to that time. As early as July 10 one or two local furnaces had sold nearly their entire capacity for the first half of 1903.

Toward the middle of the month local business was interfered with to a considerable extent by the freight handlers' and teamsters' strike, but this difficulty was ephemeral and is referred to merely as of passing interest, being felt more in the finished end of the market. About this time too a movement was reported under way to consolidate the merchant furnaces of the Central West, options having been given on the important plants. Up to the present time, however, nothing seems to have developed and probably the project has fallen by the wayside.

Concerted action was taken by the Southern furnace companies late in July, establishing $17 for No. 2 foundry, Birmingham, as the basis of contracts for the first six months of 1903. The buying movement throughout the month of July was very general, the demand coming from all classes of consumers, there being a disposition on the part of melters of iron to provide for requirements as far into the future as possible. This feeling was doubtless prompted by the continued aggravating scarcity of spot metal and the poor deliveries of iron on contracts, with little relief in sight for many months. The continued strike of the coal miners in Pennsylvania and Virginia, too, was disheartening, indicating higher prices. It is notable, however, that some of the most important buyers were disposed to await developments, predicting lower prices toward the latter part of the year, and, in the main, their prophetic vision seems to have been clear; yet the very substantial basis of the trade was evident at that time.

The heavy buying movement of foundry iron which extended throughout the month of July was continued into the first part of August, some heavy contracts being placed in the Chicago district for Northern brands early in the month; but beyond this fact the salient features of the market developed little change. The difficulties against which the producers of pig iron were contending throughout the month were again reflected in the blast furnace statistics, the output for July being placed at 1,475,896 tons. The responsibility for the falling off was largely placed upon the anthracite coal strike, which caused a deficiency at the rate of about 35,000 tons a month as contrasted with the normal make. The coal miners' strike in the South, too, although of short duration in Alabama, was accountable for a reduction of 40,000 tons in that section in that month. In the Central West, too, quite a number of stacks were unable to work up to full capacity, being limited by the irregularity of fuel supply.

Southern Furnaces Withdrawn.

Toward the middle of August it was announced that fully half of the Southern furnaces had withdrawn for foundry grades from the market and that nearly three-fourths of the output of the furnaces in that section had been sold for the first half of 1903. The coke famine became more serious as the month advanced, the strain falling heaviest upon pig iron producers and bringing about the banking of 13 furnaces in the valleys and a number in the Chicago region. In Eastern Pennsylvania, too, additional stacks were blown out. At this time it was pointed out that the scarcity of coke was not so much a matter of production as a difficulty of transportation, but eventually the accumulation of coke at the ovens prevented even normal production and the congestion was not relieved until all interests had suffered very severely. In the main the responsibility seemed to be placed upon the railroads, who were unable to handle the traffic given them. Such conditions of course favored liberal importations of foreign iron, and while the Eastern seaboard was principally dependent upon this kind of metal, occasional shipments found their way into this territory. In spite of the short fuel supply there was produced in August 1,498,842 tons, but had the supply of coke and anthracite coal been normal, there seems reason to believe that the production would have reached that of May if not exceeded it.

Early in September Southern railroads advanced freight rates to Ohio River points 50 cents per ton, effective September 15, and applying on sales made subsequent to September 5. Throughout the month the market was quiet, so far as new business was concerned, but there was much dissatisfaction from the strain of unsatisfactory deliveries of raw material, particularly the difficulty of obtaining an ample supply of coke for both foundry and furnace use.

It is an interesting point that the foreign iron which had been coming into this market, almost clandestinely we may say, was openly avowed during September and quite considerable sales were made, Scotch, English, German and Canadian iron being more generally handled by the various agents. As a rule foreign iron was utilized to relieve pressing necessities only for future delivery, preference being given by consumers to domestic brands.

Anxiety About the Coke Supply.

The important announcement was made late in September throughout the iron trade circles that the management of the United States Steel Corporation had decided upon a radical change in its policy and that in the future the corporation would sell little if any raw material, especially iron ore and coke, to outside interests. The report made a deep impression throughout the trade and caused much commotion in the casting about for new lines, and no doubt there has been considerable purchasing of coal lands, if not ore properties, and the building of coke ovens in consequence of the modification in the policy of the largest interest. As the situation began to be better understood,, at least as far as coke was concerned, there was less apprehension in regard to the supply of fuel. Yet the scarcity of coke for prompt delivery became more aggravating as the season advanced, founders being obliged to pay from $10 to $12 per ton and buy from hand to mouth to keep cupolas running.

During the latter part of September the West bought more largely of foreign iron, the most important buyer being a leading cast iron pipe interest, which purchased a large tonnage for delivery at Ohio and Kentucky points. The production of pig iron in the month of September was, next to that of February, the smallest monthly output of the year; but, even so, it was not much under the 1,500,000-ton limit. The reduction of course was largely if not entirely due to lack of adequate fuel supply, and throughout the month of October the deficiency in coke was the most important factor in the market, being the result of continued inadequate transportation facilities.

While the anthracite coal miners' strike was indirectly responsible for the shortage in pig iron production, when the whole subject is weighed it proves to have been only a minor element, and from the continued heavy melting all over the country it was evident that strike or no strike the output of the domestic furnaces would have been under the melting of the iron and steel plants in this country.

Larger Importations.

Throughout the month of September the difficulty of obtaining prompt shipments of pig iron was a most annoying and also a most serious feature of the situation, giving rise to larger and more general importation of foreign brands, Bessemer as well as foundry grades. There was quite liberal purchasing of foreign iron by commission houses on their own account to supply their customers with prompt delivery iron in the future, such houses acting in the capacity of merchants, and of course additional premiums were demanded for extraordinary risks.

During the second week of October car shops, car wheel manufacturers and pipe works bought a little more freely of both domestic and foreign iron in the local market, but as a rule there was no general buying except in small lots in a hand to mouth way.

Toward the latter part of October it was evident that the settlement of the anthracite coal miners' strike would not be productive of an appreciable increase in the supply of metal, for this territory at least. But there were freer offerings from Eastern houses who invaded the territory of local dealers to a considerable extent, resulting in an easier feeling among consumers.

Coke Prices for 1903.

Late in the month the important announcement was made that the Frick Coke Company had named $3 at the ovens for Connellsville coke for 1903. But this meant apparently little more than the establishment of a price for the constituent companies of the United States Steel Corporation, as most of the merchant coke ovens which had been selling under the Frick name for some years will hereafter sell their own product under their own names. It is understood that the Frick Company will have little if any coke for other concerns than the largest interest, of which it is a part, and that hereafter it will not cultivate the field of foundry coke.

It is worthy of note that the leading Southern foundry interests late in the month of October announced that they had determined upon a basis of $20 for No. 2, Birmingham, for the second half of 1903. But this decision was not taken seriously by the trade, and in fact subsequent transactions indicated that the furnaces themselves little expected to maintain such a level, as a considerable number of orders were accepted on a basis $1 to $2 under this price subsequently.

It is remarkable that the production of pig iron during the month of October was, next to May, the highest record of the year, but, at the same time, the active furnace capacity on November 1 was considerably under that on October 1, foreshadowing a material reduction during the month of November. As during the preceding month, the fuel famine continued to be the dominating feature of the industry, 18 furnaces being banked in the valleys and 6 in the Chicago district from lack of coke. Although it is recognized that much of the foundry iron being melted then and now was at comparatively low prices, the supply of such iron is inadequate, and the proportion of high-priced metal going into the mixture makes it incumbent on founders to increase the price of castings for next year's delivery; and in fact this has already been done by a malleable concern, who are charging $1 to $2 per ton more for malleable castings.

A Change of Sentiment.

About the middle of November a sentiment which had been developing favoring lower prices, especially for prompt delivery, including November, December and January iron, made considerable impression upon prices, there being quite a decline. There were, too, much better deliveries made of both domestic and foreign brands, and some relief through better deliveries of coke, especially of foundry grades, the heroic efforts of the railroads to relieve congestion having been rewarded to an appreciable extent. As indicated on November 1, the production during that month was materially reduced, aggregating 1,464,423 tons. On December 1, however, principally through the blowing in of blast furnaces affected by the anthracite coal strike, the weekly production of pig iron had increased, but through the difficulties still experienced of securing ample supplies of coke the actual output was not up to the normal. The shortage in Bessemer pig became more evident during the first two weeks in December when recourse was again had to foreign iron, which was obtainable at somewhat lower prices. On the other hand, it was notable that importers of foundry iron were holding off, anticipating still lower prices.

To Discourage Importations.

It is significant that producers of pig are convinced that prices of iron must be brought back to a point where less dependence can be placed on foreign iron, and to this fact largely may be due the drop in prices that took place during the latter part of November and first of December. But naturally foreign markets have declined with domestic prices, and as long as there is a lull in the foreign markets we may expect considerable competition from foreign metal.

During the second week in December negotiations between the leading interest and the Bessemer Association for the purchase of a large quantity of iron for delivery after April, 1903, were resumed, the easier feeling among producers doubtless contributing to this event.

Billets, 1902.

The most interesting feature in 1902 as far as the billet trade was concerned was centered in the importation of foreign steel, it being estimated that between 40,000 and 50,000 tons of German and Belgian billets have been imported and sold to mills in this section alone during 1902, with some considerable quantities still pending. It is notable, however, that some domestic steel plants, although pressed for billets themselves, are making a heroic effort to supply some of the more important mills with the domestic product to limit the importation of foreign material as much as possible. The consumption of steel billets, both Bessemer and forging, by independent mills in this section is estimated at 240,000 tons annually, but from the fact that the great mass of steel which is rolled into finished shapes is either produced by the works themselves or goes to outside rolling mills, and is largely sold on the sliding scale or long time contracts, the sales from week to week and from month to month of domestic billets are without special significance.

Early Importations.

The great scarcity of billets available to outside rolling mills throughout the year, notwithstanding the great increase in the capacity of open hearth furnaces, has attached to this market considerable interest out of the ordinary. It is interesting to note in this connection that some importations of foreign billets, although small, began as early as the first week in January, 1902, and during the last week in the month Canadian mills placed considerable tonnage in Pittsburgh and the East, but it was not until the latter part of April or first of May that Chicago mills became seriously interested in foreign steel. Throughout February, March and April the smaller rolling mills in the Central West and East dependent upon the open market were seriously affected by the famine in steel. It was early realized, however, both in the West and East, that the relatively high prices current for billets, both domestic and foreign, left a very slender margin of profit for the mills rolling sheets or drawing wire. Early in April an interesting development was the purchase of 11,000 tons of foreign billets by the leading producing interest. It was learned later, however, that such purchases were made to cover sales of wire products for export, no necessity having arisen with them to use foreign steel for domestic requirements. As the season advanced individual transactions in foreign billets became more numerous, and although no individual sale was large, in the aggregate there was considerable tonnage. It is notable that while prices of foreign billets have varied from $3 to $4 per ton, the variation in the prices of the domestic output has been only about $1 per ton; but even such fluctuations may be ignored as insignificant, being due to special instances or to special requirements of individual transactions.

Steel Rails, 1902.

The output of the domestic steel rail mills in 1900 was 2,385,682 tons. During 1901 there were produced 2,874,639 tons. It is estimated that the output for 1902 will prove to be close to 3,000,000 tons, through the beginning of rolling by new mills and also to the old mills having largely increased capacity through the exercise of various methods, one of the Eastern mills whose rated capacity is 30,000 tons having occasionally been able to turn out 50,000 tons per month, and the Western mill producing at the rate of over 60,000 tons per month. The aggregate sales in 1902 for 1902-1903 delivery were, in round figures, 2,500,000 tons, 1,900,000 tons being for 1903 delivery—against 2,350,000 tons in 1901 for 1902 delivery—the Illinois Steel Company being sold into the middle of December and the Carnegie Steel mill to November of 1903. There were carried over from 1901 to 1902 unfilled orders for between 350,000 and 400,000 tons. From 1902 to 1903 there will be carried over probably less than 300,000 tons. During 1902 there were imported about 75,000 tons of European rails for domestic consumption, and there are about 200,000 tons more which have been purchased of German and Belgian mills principally for delivery during the early part of

1903. In addition, Mexican and Canadian roads have placed considerable tonnage for importation. These facts lead to the belief that the consumption of rails by American railroads in 1902 was the largest in the history of the industry—over 3,000,000 tons—with the indication that 1903 will be fully as great as 1902.

At the opening of 1902 Mexican railroads were in the market for 100,000 tons of rails, half the tonnage of which was placed with German mills and half with American mills. Early in February a leading Southern road found it impossible to place an order for 25,000 tons with domestic mills for 1902 delivery, and subsequently placed an order for 30,000 tons of German rails for delivery at Pensacola. During the latter part of March there was some indication that railroads had either over-purchased or were tempted by the premium obtainable to resell contracts for steel rails for spring delivery. This condition did not last long, however, and about the middle of April it was interesting to note a selling movement of considerable blocks of old steel rails for rerolling, trunk lines and coal roads disposing of considerable blocks to Western mills. About this time, too, there were liberal offerings of old rails from Europe, but because of the awkward sections of European design there was little trading. Toward the latter part of May there was an awakening in the domestic trade through the selling of 30,000 tons at Chicago for the last part of 1902, and not a few railroads were only waiting the establishment of the official price for the following year to place large contracts.

Official Prices for 1903.

During the first week in June the four interests controlling the steel rail mills reached an agreement for 1903, deciding to open books for that year at $28 for standard sections at the mill, being the same price as was established the year previous. Compared with other steel products the price was considered low and therefore caused some surprise. Immediately orders aggregating between 350,000 and 400,000 tons were placed, they having been held in abeyance until the official price was named. The principal trunk lines centering at Chicago were the first to place their orders. Throughout the summer and fall there was continued liberal buying of standard sections by railroads, and a most active, urgent, and, in some cases even importunate demand for light rails for electric roads and mining companies. Even in December there was a demand for both heavy and light sections which could not be satisfied by domestic mills and further importations were pending, as much as 100,000 tons being under negotiation for shipment by sail direct from Europe to the Pacific Coast. Of the 2,500,000 tons sold for 1902-1903 delivery, the Western mill has taken about 700,000 tons, about 90 per cent. being of standard sections.

Iron and Steel Bars.

There have been some counter currents and unlooked for developments in the market for both steel and iron bars during the year. At present the bar outlook is probably the most unsatisfactory of the situation, but during the first quarter of the year business was active superficial indications pointed to the largest consumption of bars in history. Early expectations, however, were not fulfilled during the remainder of the year, and especially during the third quarter of the year conditions were even less favorable. Upon the whole it is estimated that about 600,000 tons of bars—iron and steel—were contracted for in the district tributary to Chicago and supplied from this point; about one-fifth of this amount being for iron bars, which are consumed largely by manufacturers of cars.

At the beginning of the year iron and steel bars were quoted at the same price, 1.65 cents, Chicago. But with continued active demand the market hardened until some time in March it seemed probable that a higher level would be forced by consumers. It was then announced that the official price would remain 1.50 cents, Pittsburgh, equivalent to 1.65 cents, Chicago, until April 1, to allow the largest consumers to place contracts for the following year, running from July 1, 1902, to July 1, 1903. Some very heavy contracts were placed, the largest buyers taking advantage of the offers, and during one week alone 100,000 tons were contracted for. On April 1 the official price of soft steel bars was advanced to 1.60 cents, Pittsburgh, or 1.75 cents, Chicago. But the distinction between placing contracts and the specifying on such contracts must be kept in mind to fully understand later developments. Soon after the first of the year bar iron was placed on a higher level than soft steel bars and maintained in that position nearly the entire year. During the latter part of November, however, iron receded a little under the official price level of steel. In the fall months of 1902 it became evident that a great many consumers had magnified their requirements or otherwise overpurchased in the expectation of realizing on the advance which seemed almost inevitable at the time orders were placed.

Long-Time Contracts.

As far back as June, 1901, contracts were placed for the following season's supply, extending from July, 1901, to July, 1902, on the basis of 1.50 cents, Chicago. Many of these contracts, especially for iron bars, had not been specified for when the heavy buying began in March, 1902, for the next year's needs, beginning July, 1902, and extending to July, 1903. By making these latter contracts three or four months before the usual time buyers were insured of a quantity of bars at relatively low prices for 16 months in advance, the mills taking the responsibility of higher prices for raw material.

For various reasons, prominent among which may be noted the wet weather and the failure of the corn crop in certain sections, manufacturers of agricultural implements, who are the largest consumers of bar iron and steel bars—car shops being the largest consumers of bar iron alone—not realizing the business they had anticipated, of course, were unwilling to specify on contracts for bars beyond known requirements. Carriage and wagon manufacturers, also, experienced an unusually unprofitable season because of the very wet summer, which required little if any resetting of tires and a very light consumption of bolts, rivets, and bars. Hence they likewise have been unwilling to specify for the benefit of the mills. The only large users of bar iron who have consumed more than they had anticipated have been the manufacturers of cars. Large contracts were placed on account of the car shops, beginning in November, 1901, and extending into February, 1902. Most of these contracts extended up to July, 1902, but many of the mills failed to make deliveries until in August. From that time until November car manufacturers were not an important factor in the market. During November, however, both railroads and independent car manufacturers purchased appreciable quantities of bar iron, most of the contracts placed by them being on the basis of 1.80 cents, Chicago. But later the price dropped to 1.70 cents, at which price some few contracts were placed.

Specifications Scarce.

During October and November some iron mills were closed down and are still idle, it being impossible to obtain specifications, although the books showed quite a volume of orders. To some extent the same adverse conditions affecting bar iron influenced the market for steel bars, but the prices of steel have been better maintained than have those for bar iron; there is also evidence, however, that steel bars have been overpurchased. In common with other steel products, for months steel bars could not be purchased at official prices, in many cases premiums being obtained for prompt delivery. During the past few weeks, however, there has been a decided change, soft steel bars being readily obtainable at 1.75 cents, Chicago, with the mills hungry for specifications. The unsatisfactory condition was recognized by the changing over of some of the steel bar mills to other steel products and also to the closing down of some steel bar mills entirely, even by the largest interest in the market. During the last week or two in December there was some little improvement, some new business both in iron and steel coming forward to give encouragement.

Support for the Market.

The scarcity and the continued advance in prices for scrap iron and steel, together with the difficulty in ob-

taining specifications on orders for bars placed, brought about keen competition among the independent bar iron mills. With a tendency toward a narrowing of the margin of profit, conditions seemed to be getting worse rather than better. To improve the market and to insure higher prices an effort was made to control the situation, and, while from a lack of unanimity of action this policy was not fully carried out, there was an understanding among the various interests at different times during the year. Twice an effort was made during the year to consolidate the bar iron mills in the Central West; twice the efforts have failed through the unkindness of the money market; but the project has not been entirely abandoned. It is hoped to bring about a consolidation of these interests with a capital stock of $2,000,000, the plants being bonded for $1,000,000.

Structural Material.

The volume of business transacted in the structural trade at Chicago during 1902 was the largest in the history of the industry, not only in tonnage, but in value. It is estimated that the sales will aggregate 300,000 tons, showing an increase of fully 40 per cent. over 1901. A wonderful quickening passed through the local building trade early in the year, which was stimulated by the passing of an ordinance repealing the restriction on the hight of fire proof buildings. According to latest official figures the value of the new structures erected in Chicago during the year amounts to $50,000,000, surpassing all previous records. One of the most significant features of the building trade was the issuing of many permits for the construction of factories and warehouses, although the construction of large office buildings in the business center of the city embraced a large portion of the money value. The placing of orders by car works and railroads for bridges and other structures has also shown an increase almost phenomenal.

It is interesting to note as indicating the enormous demand for structural material that the American Bridge Company closed contracts during the month of May aggregating 70,000 tons. The company had orders on hand even in January, 1902, equivalent to about eight months' output. Some of these orders were on account of railroad companies having Chicago as a terminus. During the latter part of September important bridge contracts were placed by railroad companies which in some cases covered deliveries extending up to the middle of 1904. This is the first instance in the history of the structural industry that contracts for such material have extended so far into the future, and it would scarcely be possible for any but a railroad company to contract business so far ahead.

Importations of Beams and Angles.

Early in February it became evident that the supply of structural material was inadequate to the demand and the deliveries were becoming more and more unsatisfactory, with the importation of beams and angles contemplated, which crystallized later in the month into orders for foreign beams and angles for bridge work on the line of the Chicago, Milwaukee & St. Paul Railway; but a large portion of the order went to domestic mills, both East and West.

Even during the latter part of Feburary it seemed difficult to place contracts before the third quarter of the year, and, in some instances orders were booked for the last quarter. It was pointed out in March, however, that the scarcity of structural material was more apparent than real in that the changes made through consolidation gave a wrong impression, as formerly bridge and structural shops drew on different mills for a supply and by arranging orders for simultaneous deliveries of different sizes obtained the necessary material to promptly carry on the work. After consolidation, however, simultaneous deliveries were not so easily arranged for and work was delayed because a small percentage of particular sizes of material had not been delivered. It developed in April that, the structural mills being woefully behind in deliveries, if material could be obtained promptly handsome premiums would be paid. Gradually as the season advanced such premiums were paid to a very large extent wherever supplies were available either for shipment from the mills or from local yards. At different times during the year small orders ranging from 400 to 500 tons of foreign beams and angles were sold through Chicago importers to various points in the West, including Chicago, Kansas City, Seattle, San Francisco and intermediate points, the latest sales being to the Pacific Coast by sail from Antwerp.

During the last two months it became evident that the structural mills had greatly increased capacity. This fact was reflected in the discontinuance of premiums in large measure, and the reduction in prices from local yards, it being possible to obtain much earlier shipments from the mills at official prices. Large beams and angles are now available in from four to eight weeks, but on medium and light shapes three to six months are required to make deliveries.

Plates.

It is estimated that the sales of plates in the Chicago market during 1902 aggregated about 225,000 tons. The local mill is sold to next July, and the Eastern mills selling in this section have orders booked into the middle of the third quarter of 1903. At this point it is interesting to note that the plate capacity of the local mill will probably be increased materially during 1903, among other improvements which are contemplated by the United States Steel Corporation.

During the latter part of January, 1902, plate capacity had been so greatly increased that even the ship building, bridge construction, car, locomotive and boiler shop orders seemed insufficient to keep the mills running for several months. But early in April it was evident that a material change had taken place in the market, the plate mills that were lagging behind early in the season having important commitments for future delivery. The placing of large contracts for the building of ships on the lakes was responsible for a large tonnage, some of the orders being placed early in July. Late in October the plate trade gave continued evidence of great congestion, there being work enough, even urgent in character, to keep the rolls busy continuously at high tension. Late in October and early in November, notwithstanding the phenomenal previous business, car builders purchased large quantities of plates for 1903, the aggregate of such sales being nearly 6000 tons, mainly placed in the Central West. During December important contracts of considerable tonnage were placed for ship building.

Sheets.

Probably the most conspicuous feature of the trade in sheets during the year has been the decided change wrought by the entrance of independent mills more largely into the field, the increased capacity giving rise to much active competition, resulting at times in a feverish and unsettled market and irregular prices, the usual tendency being toward a lower level. Even in January the independent mills became very aggressive and offered inducements attractive to buyers, accepting contracts for future delivery at better terms than the combination mills. Toward the latter part of the month, however, the market hardened, it being anticipated that the independent mills would advance prices, which became operative the first week in February, and many of the mills being well supplied with orders the market ruled firmer, with difficulty experienced in obtaining prompt deliveries. Toward the middle of February it began to be feared that the scarcity of steel would affect finished products adversely, the capacity to turn out sheet bars being limited, but the slackness in other lines gave some relief. The mills at that time were about 60 days behind in filling of orders, with an especially good demand for both black and galvanized sheets. During March there was considerable activity, with large business, especially in galvanized sheets, while black sheets, especially light, were rather quiet. Heavy gauges, however, it is noted, were scarce, with the mills much in arrears. This condition continued into the middle of April, at which time the mills were reported from six to ten weeks behind in deliveries.

Temporary Liberal Buying.

Late in April there was some very liberal buying of light sheets by implement manufacturers, which continued into the first week in May, but by the middle of the month the demand for light sheets had fallen off considerably. During June the market continued to harden and by the middle of the month a premium of $2 was being paid in a small way over combination prices. This was followed, shortly after the middle of the month, by freer offerings by independent mills, especially of galvanized sheets, resulting in a weaker market and lower prices made by independent concerns, but prices made by the combination mills remained unchanged. During the latter part of June the market became further unsettled from keen competition, with prices irregular. Light sheets were especially slow and weak, but heavy sheets were well sustained. Toward the latter part of the month the report was current that the American Sheet Steel Company had reduced prices, but this was speedily denied.

Keen Competition.

During July and August there was some little improvement in tone, especially for light sheets, but in September both galvanized and light black sheets were very slow, although toward the middle of the month there was a more active movement, with the jobbing trade especially better. Yet, while there was a liberal volume of business, keen competition of the independent mills continued the unsettled feeling. In the first week in October the American Sheet Steel Company announced a reduction of $5 per ton, the decline being the effect of overproduction and following immediately upon heavy offerings by large Western jobbers at prices considerably under those previously current. But the struggle continued, outside mills offering freely and meeting the cut in prices by the combination interests. It is notable, however, that the lower prices did not cut off business, sales continuing heavy. Keen competition continued through November and into December, there being no special activity, however, although a fair movement into consumptive channels.

Merchant Steel.

Even early in January the capacity of the mills in this line were well engaged, with a good trade in progress in plow steel. Toward the middle of the month some new business was contracted, deliveries extending into April. Crucible steel, however, gave some indication of feeling the competition from the product of the independent mills. During the latter part of the month the market hardened, a better demand springing up, some orders being booked into the third quarter of the year. That the volume of business throughout the year was very much heavier than during the preceding year was made evident from the continuous reports that during each succeeding month in the year the shipments were the heaviest of any corresponding month in any previous year, and during April there were the largest shipments for any one month of record. During February there were heavy specifications against contracts already placed, and new business placed for the second and third quarters of the year. In fact, toward the last of the month large manufacturers restricted orders to regular customers because of heavy business booked; toe calk steel was advanced to 2.25 cents, base, Chicago, at this time.

A Rush to Cover Requirements.

Early in March the implement manufacturers came into the market with a rush to place contracts for the coming year. Mills advised customers to act promptly, as indications pointed to capacity being fully taken within a very short time. Cold rolled shafting, open hearth steel and tire steel were advanced at this time. Throughout the month of March implement manufacturers continued to place contracts for season requirements and for specialties. Early in April one of the largest manufacturers announced that their full capacity had been sold on one specialty up to July, 1903. By the middle of April most of the large consumers had covered their requirements for the season. Toward the latter part of April carriage and buggy manufacturers made their appearance in the market, they usually placing contracts from 30 to 60 days after implement manufacturers. There was especially brisk buying of tire steel. Such business continued more or less throughout the month of May, and a little beyond the middle of the month open hearth spring steel was advanced 20 to 25 cents, with a change in differentials on cold rolled steel other than crucible announced. About this time manufacturers expressed solicitude for the placing of business by tardy consumers, which was followed by the withdrawal of one large mill from the market until July 1, 1903.

After the middle of June there was some irregularity in crucible steel, resulting from increased competition from independent producers, this being especially noticeable on ordinary grades, other kinds being much better sustained.

Renewed Buying.

At various times during July a secondary demand for spring and tire steel sprung up, carriage manufacturers being the principal buyers. There was also some further contracting for long delivery for agricultural steel. It is worthy of note that during July large Canadian manufacturers of agricultural implements placed heavy long time contracts with American companies for their requirements of agricultural steel, running into January, 1903. Late in August some of the independent mills making agricultural, open hearth and spring steel were reported caught up on orders and were in the market for new business. About the middle of September there was a notable scarcity of large size rounds agricultural steel.

During the last two weeks in September there were some important supplementary orders for agricultural, machinery and tool steel placed, and in October a number of belated manufacturers, who had failed to cover contracts previously, were enabled to provide for wants for the next year on tire and spring steel and shafting. During October the mills were hampered by a lack of transportation facilities, which delayed shipments and caused considerable accumulation at the mills, one mill piling up stock at the rate of 1000 tons per day. During November and December the market was without special activity or important feature.

Merchant Pipe.

Early in the year independent tube mills became quite aggressive, there being some considerable competition for the little business pending, but the leading manufacturers showed no disposition to recognize changed conditions, believing that trade would right itself. During February there was some little improvement, with less active competition, but the enlarged producing capacity which had been provided during the previous year made more impression upon the situation, it being claimed that independent mills had a very large percentage of the entire output of the country. Active competition followed, with lower prices named by independent producers. In March, however, there was a slight advance which stimulated trade, and this was followed by more hardening of the market about the middle of the month; but trade fell off toward the end of March. During April casing was advanced 5 per cent., and toward the latter part of May the price on 14-inch, outside diameter, and larger pipe was advanced about 7 per cent., with an improved demand in June, followed by a slow and easier market in July, with some little improvement again experienced in August, followed by another lull and gradual improvement in business early in September.

During the latter part of September, however, competition became again very keen, with the market unsettled, which state continued throughout October, with liberal offerings by independent mills. Toward the latter part of October buyers were holding off in anticipation of lower prices, intimation having been given to various large consumers that it would be well to reduce stocks to the minimum. This policy was followed out and

about November 10 the long expected reduction in prices was announced by the National Tube Company, effective November 12. It is well to remember that the reduced prices resulted from increased productive capacity and not from any important decline in trade. Business continued quiet until the middle of November, when there was some little improvement, although the lower prices by no means eliminated competition. During December a number of large contracts extending into 1903 were placed, more business being done in one week toward the middle of December than at any time since the middle of the preceding November.

Old Material.

Throughout the entire year there has been a great scarcity of scrap of all kinds, the multiplication of open hearth furnaces being responsible for the little metal available in the open market, and with a good demand at all times for both heavy and light material, prices steadily but gradually advanced, the average price for the year being the highest of any time within the last decade. Toward the latter part of the year, however, rolling mills by holding off were able to control the market for light products. The money market, too, is said to have influenced the prices of scrap to some extent. The shutting down of some mills also redounded to the advantage of active works. The country has been scoured for scrap of various kinds and at all times such material has found a ready outlet through dealers. Toward the close of the year the market gave evidence of hardening under the influence of more liberal buying by the mills. There has been a special scarcity of old car wheels, which have been in great demand because of the scarcity of charcoal iron. Old rails, too, have commanded high premiums and sold readily, although at times there was considerable fluctuation of prices.

Average Prices of Pig Iron, 1902.

Months.	Local Coke, No. 2.	Lake Superior Charcoal.	Ohio Strong Soft, No. 1.	Southern Coke, No. 2.
January	$15.80	$19.25	$18.35	$15.45
February	16.50	20.25	19.50	15.65
March	18.15	20.65	19.75	15.65
April	18.65	21.50	20.35	16.40
May	20.50	22.80	23.44	19.23
June	21.50	23.50	24.00	21.25
July	21.25	25.00	24.00	22.90
August	21.75	25.75	24.65	21.00
September	23.00	26.00	25.50	23.00
October	23.00	26.00	25.50	23.65
November	23.00	26.00	27.00	24.00
December	23.00	25.25	27.50	23.00
Average for year.	$20.50	$23.50	$23.30	$20.10
Average for 1901....	$15.00	$17.50	$16.50	$14.60
Average for 1900....	19.12½	22.00	20.75	18.35
Average for 1899....	17.65	19.80	19.67	17.75
Average for 1898....	11.00	11.60	12.00	10.45
Average for 1897....	10.60	13.00	12.25	10.25
Average for 1896....	11.70	13.62½	14.50	11.40
Average for 1895....	11.80	13.75	14.25	11.75
Average for 1894....	10.60	14.75	13.50	10.75
Average for 1893....	12.80	16.12½	16.00	12.75
Average for 1892....	13.90	16.75	16.75	14.00

Average Prices of Finished Iron and Steel.

Months.	Common bar iron. Cents.	Soft steel bars. Cents.	Angles. Cents.	Smooth machinery steel. Cents.	Open hearth spring. Cents.
January	1.67	1.67	1.75	2.00	2.30
February	1.75	1.65	1.75	2.00	2.30
March	1.85	1.75	1.75	2.00	2.45
April	1.87½	1.75	1.75	2.00	2.45
May	1.86	1.75	1.75	2.00	2.53
June	1.75	1.75	1.75	2.00	2.65
July	1.77	1.75	1.75	2.00	2.65
August	1.80	1.75	1.75	2.00	2.65
September	1.88½	1.75	1.75	2.00	2.65
October	1.81	1.75	1.75	2.00	2.65
November	1.76¼	1.75	1.75	2.00	2.65
December	1.75	1.75	1.75	2.00	2.65
Average for year...	1.71	1.73½	1.75	2.00	2.55
Average for 1901.....	1.58	1.58	1.70	1.96	2.25
Average for 1900.....	1.75	1.75	2.00	2.25	2.80
Average for 1899.....	1.80	1.90	2.00	2.50	2.85
Average for 1898.....	1.05	1.10	1.25	1.55	1.61
Average for 1897.....	1.11½	1.13	1.19	1.53	1.66½
Average for 1896.....	1.30	1.30	1.40	1.62½	1.87½
Average for 1895.....	1.25	1.37½	1.50	1.70	1.85
Average for 1894.....	1.10	1.25	1.40	1.70	1.85
Average for 1893.....	1.47½	1.60	1.82½	2.00	2.05
Average for 1892.....	1.62½	1.73	1.97½	2.11	2.09

Average Prices of Old Material.

Months.	Old iron Rails. Gross ton.	No. 1 Railroad Wrought. Net ton.	No. 1 Busheling Scrap. Net ton.	Heavy Cast Scrap. Net ton.
January	$21.20	$15.40	$11.35	$11.70
February	22.37½	16.50	11.87½	12.37½
March	24.00	18.83¼	13.50	14.33¼
April	24.00	19.37½	13.50	14.00
May	24.00	20.10	13.50	14.40
June	24.00	21.00	13.62½	14.50
July	24.20	21.00	14.40	14.70
August	24.50	20.50	15.00	16.00
September	24.87½	21.37½	15.00	16.87½
October	25.00	21.30	15.00	17.00
November	24.62½	21.00	14.87½	17.00
December	24.16½	19.83¼	14.16½	17.50
Average for year.	$23.91	$19.68½	$13.81½	$15.03
Average for 1901....	$19.50	$15.00	$10.80	$11.25
Average for 1900....	17.90	15.00	8.00	11.00
Average for 1899....	21.00	17.25	10.15	12.40
Average for 1898....	12.37½	11.25	6.62½	8.15
Average for 1897....	11.67	10.60	6.44	7.25
Average for 1896....	13.50	11.20	7.00	8.48
Average for 1895....	14.12½	11.08	7.67	8.37½
Average for 1894....	10.83	8.80	6.85	7.50
Average for 1893....	16.25	12.75	9.25	10.00
Average for 1892....	19.10	15.75	11.17	11.66

Prices of Melting Scrap.

January	$13.65	July	$19.00
February	14.12½	August	18.25
March	16.50	September	18.37½
April	16.50	October	18.50
May	17.40	November	18.50
June	19.25	December	18.50
Average for 1902			$17.37½

Stove Manufacturing in 1902 and 1903.

BY W. J. KEEP, DETROIT, MICH.

The stove business of 1903 will probably resemble that of 1902 if prosperity continues. The difficulties encountered during 1902 were entirely new. The general activity in all lines of trade dependent upon iron and coke have made it difficult to procure these materials.

Transportation facilities have not been increased sufficiently to handle these products. It has taken from eight to ten weeks to transport some cars of pig iron from the South that formerly could have been moved in as many days. There may not be great improvement in this respect, and it may be as difficult during 1903 to procure pig iron as it has been during the year just past.

The Supply of Raw Materials.

Almost any kind of pig iron has been accepted during the latter part of 1902. Iron has been loaded directly from the car to the cupola, and it has been necessary to borrow and lend more than ever before to prevent the loss of a heat. Foreign pig irons have been used to a small extent, and may be used again. The safe way is to increase stock during the winter months.

The difficulty in obtaining sheet steel in any reasonable time or quantities will make it necessary to accumulate large stocks months ahead of the time it is to be used. To reduce expense of manufacture, or on account of the strike in the steel mills in 1901, apparently too many of the mills making specially prepared steels were closed. The mills accepted orders for cold rolled and for polished steel, and would fill the order for the former at once, but would often hold back the polished steel until the season was over. As a result other sizes were cut to a disadvantage and waste, and it was necessary to purchase odd lots at greatly advanced prices. It did no good to complain. The wide separation of the mills from the managing offices caused great delays.

The coke problem is more serious than that of pig iron or steel, as the majority of the coke ovens are controlled by the furnaces and mills. The output of coke is hardly sufficient to supply the makers of pig iron and steel, and in many cases notice has been given that no outside sales will be made.

If by-product coke ovens could be constructed quickly enough it would relieve the situation, but this is impossible. There are 60 ovens in operation in Detroit and 60 more in process of erection. There are at the present time approximately 1300 by-product ovens in operation

and 1700 more in process of erection. The great majority of these ovens, however, are operated in connection with blast furnaces, and their output, therefore, does not come into the market. The number of by-product ovens whose output is available for foundry use is as yet too small to have more than a local influence.

These ovens receive coal from the mines by cars, which does not relieve the difficulties of transportation.

It has been supposed that 72-hour coke was the best for foundry use, but there is so little of this made that foundries probably use 48-hour coke most of the time.

The quality of by-product coke depends mainly upon the quality of coal used; but as by-product coke is made in retorts from which air is carefully excluded, the heat being applied through the flue walls, the coke in the retort is not partially burned as in the beehive ovens. As a result the percentage of fixed carbon is a little higher and the percentage of ash a little lower in retort oven coke than in beehive coke made from the same quality of coal. The coal is thoroughly coked in 24 hours, when it is shoved out by a ram and the retort is immediately filled with another charge of coal, making the process continuous, as the walls are not cooled down between charges. The coke is cooled by a stream of water after it is out of the retort, and it is hand picked, so that no light or spongy coke shall be sent to the founder. It is the wetting down outside the oven that gives the peculiar color to the coke, and the shape of the pieces is largely due to the way in which the heat is applied in the retorts.

To overcome prejudice it is better at first to use 10 or 20 per cent. more of this coke, and when it is found that as good and as hot iron is melted, then gradually reduce the amount used until the old ratio is reached. As the result of a year's experience with by-product coke, melting 80 odd tons of iron per day, I do not see any difference between it and other kinds. With a melting ratio of 9 to 1 in two cupolas melting about 35 tons each, and with a ratio of 8 to 1 in a cupola melting about 15 tons, the iron was uniformly hot for stove plate.

Blast furnaces are being driven so rapidly that the output is very irregular, but founders are learning to make good castings from pig iron which they would have thought they could not use a few years ago.

Coke that would have been considered unfit for the cupola is now used with perfect satisfaction. At the October meeting of the Pittsburgh Foundrymen's Association the superintendent of the Westinghouse Air Brake Company stated that they had made good soft castings with coke containing 1.68 and 1.75 per cent. of sulphur. He thought that their success was due largely to the use of considerable limestone as a flux.

The Relations of Capital and Labor.

The relations of capital and labor form an interesting feature of any look into the future. Unions of labor and associations of manufacturers are conditions which confront us. The stronger both are the less the liability of war. It is much more satisfactory for one or more representatives from each organization to meet to make agreements than for either party to deal with individuals. Both organizations should be incorporated to give contracts all the backing possible. The financial responsibility is generally on the side of the founder, yet with a definite agreement acquiesced in by the officers of the union there are generally enough honest men in any well managed shop to cause such an agreement to be respected. If the founder never breaks an agreement the men cannot afford to do so. While the present agreements between the stove manufacturers and the unions are reasonably satisfactory, there are still a few mistakes being made which may be disastrous if persisted in, such as

Opposition to Progressive Methods.

This includes the operation of machines. There is no objection to the employment of union men on machines if they will work the machines to the best advantage, but they often discourage their use while pretending to use them. This same spirit applies more or less to other processes and to all unions. Union men working on machines are sometimes fined and threatened when outside the shop.

Curtailment of Output.

Another unsatisfactory condition is curtailment of output. A limit placed on a piece man's earnings is unfair to the worker and lessens the output of the manufacturer, as also does beginning work late in the morning and stopping work early in the afternoon by piece workers, and the endeavor to compel a full day's pay for transient traveling union men, who produce practically nothing, while they take the places of absentees for a day or two. Another method of curtailing output is the breaking of heats.

Any increase of cost of any goods must be placed upon the selling price, and the mechanic is the buyer of most manufactured articles. Most of those restrictions the mechanic is placing upon himself.

A condition which limits output and which is damaging mechanics more than manufacturers is the refusal of union men to allow their own sons to learn a trade and to be prepared to earn an honest living. Each union shuts out the majority of the sons of its members, and there are not enough skilled foreigners coming over to fill the places of those who leave a trade. These restrictions upon themselves are un-American and must sooner or later produce a reaction.

Shorter Hours.

It is impracticable to reduce the number of hours of labor until there are sufficient skilled men to do the required amount of work in a less number of hours. If there were provisions made to supply enough men to do the work required it would not damage business to adopt a nine or an eight hour day, provided that it was universal and that all manufacturers in any one line of business should make the change at the same time.

These three conditions, opposition to progressive methods, curtailing production, and preventing their sons from learning a trade are weak points in the unions. Whether they will materially influence the stove business of 1903 remains to be seen. They are all contrary to the Declaration of Independence and directly damage the family of the mechanic more than any one else. Such action more than anything else stimulates the invention of automatic machines, which would never have been attempted if a proper spirit had been shown by union men. I am aware that it is a difficult thing for a mechanic to know how to work for his own interest and that the majority do the best that they know how.

The Effect of the Coal Strike.

The coal strike has greatly damaged the business of the latter part of 1902 and will no doubt affect that of 1903. Considerable stocks of hard coal stoves will be carried over, which will decrease the number to be made this year. The shortage of hard coal has increased the sales of gas stoves and of cheap soft coal stoves and many, after becoming used to soft coal, will continue to use it. Inventions to lessen the smoke of soft coal stoves have been encouraged and it is quite possible that some improvements may be made which will make soft coal a more desirable fuel. With the introduction of soft coals which are more free from smoke there may be quite a change in the character of stoves sold during 1903. There may also be perfected burners that may use crude oil or some of the cheap oil products.

The Future of the Stove Business.

The future of the stove business depends largely upon the times. If prosperity continues the temptation is to use present patterns. If a period of general depression comes competition will encourage invention, new designs and a general improvement in goods. There is more money made on new goods that are not influenced by competition. In the case of the more progressive firms there seems to be no chance of lessening the weight, or the actual cost of molding, or finishing of stoves as now made. If the patterns are excessively

light it costs more to manufacture, and the saving in iron is balanced by the cost of making. The saving in the future must lie in more systematic arrangement of work and of men, in improved methods of handling material, in improved power, using steam more economically and electricity more generally, in saving of gas and water bills, and in stopping small leaks which, taken together, amount to a large sum.

In a recent paper by Francis Hodgkinson on the use of the steam turbine, he pointed out the fact that the conditions of operation most desirable for this class of work include a fairly high boiler pressure, a good vacuum and superheated steam. He then went on to discuss the floor space required for turbo-generator outfits of various sizes: A 400-kw. outfit required 19 feet by 4 feet 6 inches floor space and was 7 feet 6 inches high; a 750-kw. outfit, running at 1500 revolutions per minute and having two cylinders with a reheating cylinder between them, required 36 feet by 8 feet floor space, and was 7 feet 6 inches high; a 1000-kw. outfit of this latter type took 42 feet by 8 feet on the floor, and 8 feet of head room. The various items of floor space figure out, per kilowatt as follows: The 400-kw., 0.214 square feet; 750-kw., 0.384 square feet; 1000-kw., 0.336 square feet; the two latter figures being largely increased by the intermediate receivers. The cubic volume occupied per kilowatt was: 400-kw., 1.6 cubic feet; 750-kw., 2.9 cubic feet; 1000-kw., 2.7 cubic feet.

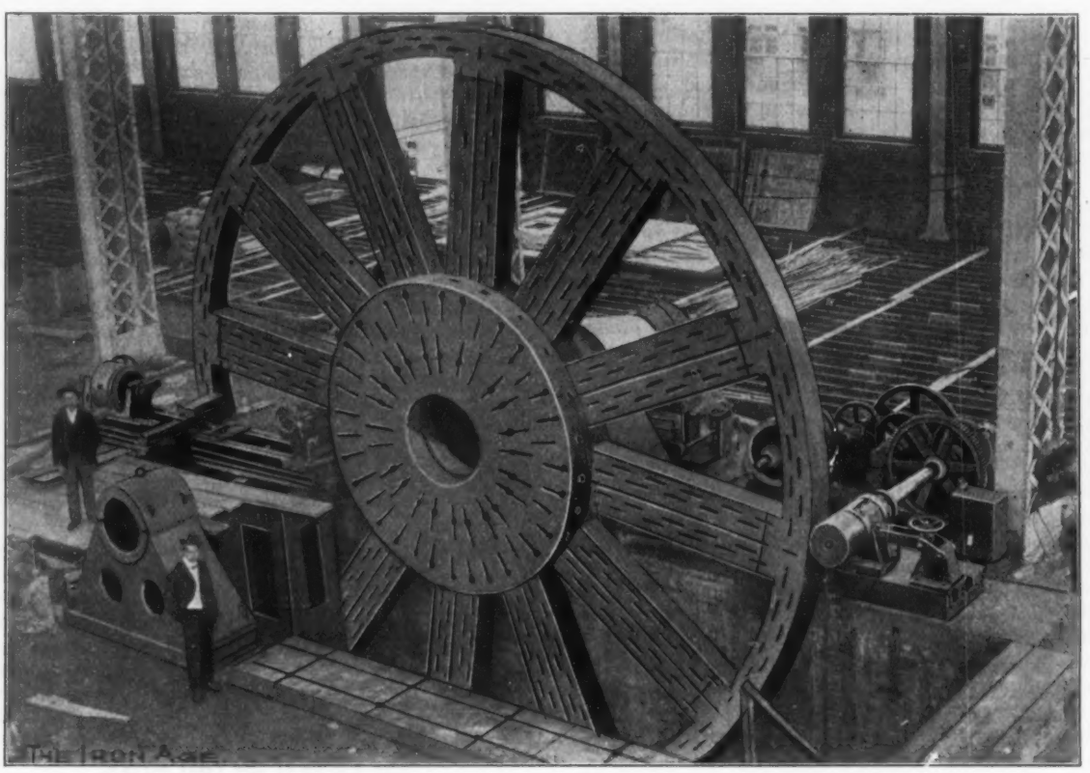
Soon after the starting of the Aurora, Elgin & Chicago (electric) Railway, a defective insulator on one of the 26,000-volt, three-phase transmission lines set fire to the pole, which was so charged with the high tension current that the flame shot straight out from it in all directions and was of a bluish tinge. The combustion was very rapid and was accompanied by a roaring sound. The influence of the static charge which the pole had received evidently drove the flames out at right angles to it, and this, together with the leakage from the lines through the pole, was also probably the cause of the bluish color of the flame and of the roaring. The ammeters at the power house showed very little disturbance, so that the quantity of current escaping to ground over the burning pole must have been very small.

A Forty-four-Foot Pit Lathe.*

BY JOHN M. BARNAY, CINCINNATI, OHIO.

The machine here described was designed to meet the demands of a manufacturing establishment of the heaviest type of electrical machinery. The ever increasing dimensions of this class of machinery make it particularly desirable that the existing heavy machine tools should be capable of extension of capacity with a view to probable future requirements, and that a pit lathe is peculiarly adapted to such extension will doubtless be readily admitted.

The face plate of this machine measures 30 feet in diameter, and the present dimensions of the pit will admit of swinging 44 feet on centers, with a maximum width of 12 feet. The large face plate is built up of 12 segments. The rim is of box section, the ends of the rim in each section being finished to make the joint, and the segments being held together at the rim by body bound bolts. The arms are slotted for bolts, and the space between segments is also shaped to receive the usual square headed bolts, as the inner end of each segment is fastened to the smaller face plate by several body bound bolts.



A FORTY-FOUR-FOOT PIT LATHE.

The smaller face plate is cast in one with the forward section of the spindle. The spindle revolves in a babbitted bearing measuring 48 inches in diameter by 68 inches long, the dimensions of the rear bearing being 22 inches in diameter by 28 inches long. It is calculated that the pressure on the main bearing will, at times, attain a maximum of 125 pounds per square inch.

Teeth were cast into the periphery of the 12-foot face plate for the purpose of driving same while turning up the spindle bearing, which operation is illustrated in Figs. 3 and 4. After the spindle was finished by this method the segments of the large face plate were bolted on, the spindle assembled on the head stock, and the periphery of the 30-foot face plate turned off, with the spindle in its own bearing.

A feature of interest in connection with this machine is the method of drive adopted, which is a friction roller, 18 inches in diameter, made of compressed paper,

* Paper presented at the New York meeting of the American Society of Mechanical Engineers.

while the rim of the large face plate, 15 inches wide, affords the necessary contact surface for driving, as shown in Figs. 1 and 2. Power is supplied by a 75-horse power motor, quadruple geared, the use of the multiple voltage system giving the machine a range covering all diameters from 6 feet to the present capacity, though the gear train is designed to admit of two changes of back gear in addition.

The tool carriages are supported on massive cast iron columns resting on the bottom of the pit, and the feed mechanism is driven by an independent motor properly back geared. By the use of the multiple voltage controller, and a device called a feed regulator, any rate of feed from 3-64 to 2¾ inches per minute can be had without a change of back gears. There was also designed for this machine an outboard bearing to support the outer end of mandrils and boring bars, which is provided with a geared sleeve connected to a train of back gears driven by an independent motor; the whole being self contained and constituting a portable boring and facing tool.

An approximation of the total amount of cast iron used in the construction of this machine places the weight at 480,000 pounds, of which the spindle and two face plates together weigh about 155,000 pounds.

As would be expected in this class of tool, the center of gravity of the revolving parts lies very close to the edge of the pit; hence, the matter of a substantial foundation became one of considerable importance, and to meet the severe requirements the design of the head stock provides a large area for the distribution of this pressure, so that the forward part of the head stock alone covers an area of 68 square feet. The masonry foundation consists of a layer of the best Portland cement grouting on top, followed by a 5-foot layer of vitrified brick, which in turn rests on a massive column of the best grade of pressed brick, all laid in first quality Portland cement.

Fig. 1 shows the assembled pit lathe driven by the friction roller while taking a heavy facing cut, on which occasion four tools were employed. The picture also shows the driving motor with its train of gears and the mechanism employed for adjusting the pressure on the friction roller.

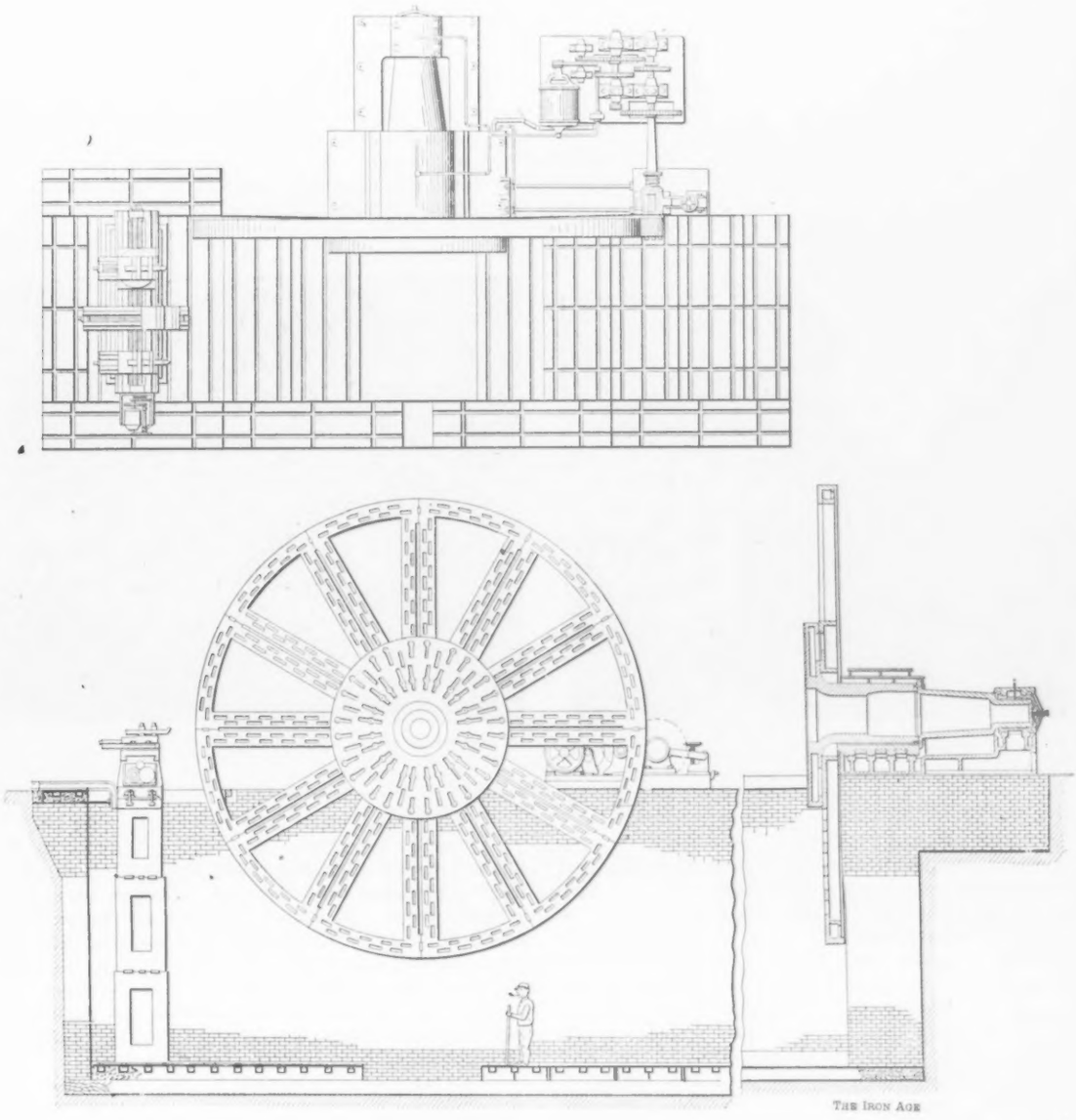


Fig. 2.—Plan and Sectional Elevations.

A FORTY-FOUR-FOOT PIT LATHE.

According to returns received by the *Railroad Gazette* there were built during the year just elapsed 4070 locomotives, as against 3,384 last year. This figure is official throughout and required no estimating. The number for the current year includes 74 electric locomotives. The real meaning of this figure is perhaps best realized by calculating the expenditure involved, which would be nearly $48,000,000, if the average cost per locomotive is assumed to be $12,000.

Copper as a Factor in Industrial Progress.

BY JAMES DOUGLAS, NEW YORK.

The steady as well as rapid growth of the copper industry of the Western section of this country since the extension westward of our railroad system is due primarily to the transportation facilities, which the roads have provided for the development of the very large ore deposits which nature stored in the Rocky Mountain region. But it is also and equally attributable to the energy and ingenuity exhibited by those in charge of the departments of mining and metallurgy of the large companies which have lavishly supplied the funds for carrying out the plans of their technical advisors. It is, however, the extraordinary size of the ore bodies which has warranted and stimulated their rapid exploitation, and again it is the heavy volume of freight which they supplied to the railroads which enabled the transportation companies to reduce rates to a figure which alone now allows the mining companies to live. Thus these natural and artificial forces and agencies have reacted on one another with the result of benefiting the railroads, and permitting the mines to increase production in the face betimes of a falling market, and of a persistent decline in the value of their ores.

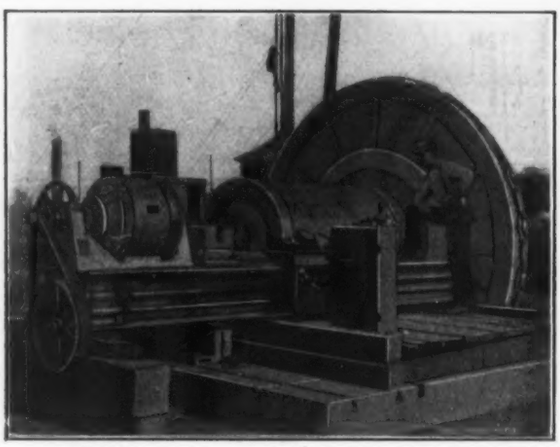


Fig. 3.—Turning Up the Spindle.

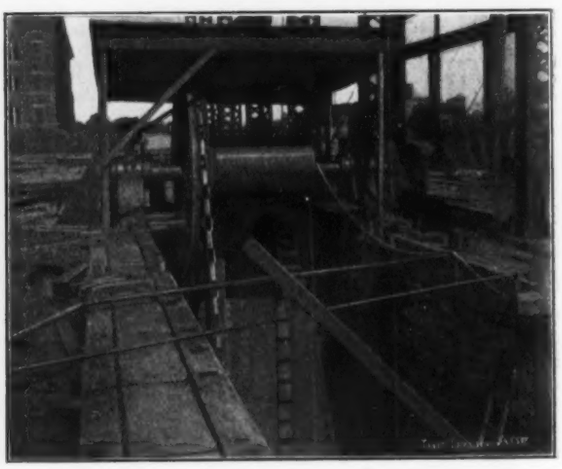


Fig. 4.—Driving Gear for Turning Up the Spindle.

A FORTY-FOUR-FOOT PIT LATHE.

The copper industry as a factor in the growth of the West should not be measured by the quantity of the metal produced but by the grade of the ore and the intricacy of its metallurgy. In both these respects it differs widely from its sister industry, that of iron and steel. By virtue of these conditions, it has supported comparatively large centers of population, receiving high wages, and which maintain a high standard of living, and therefore consume a much larger quantity of high class freight than any corresponding population in the East. This has resulted greatly to the benefit of the merchants and the railroads.

While the average of the iron ore mines throughout the country is above 55 per cent., the net yield of the copper, even of the West, will not much exceed 3 per cent. To produce the large tonnage of pig iron of 15,878,354 tons in 1901, there were mined 28,887,479 tons of iron ore, and yet to produce the 271,949 tons of copper there must have been extracted from bodies which, though large as copper deposits, are insignificant in size, when compared with our great iron ore beds, not less than 10,000,000 tons of ore, or about 33 per cent. of the iron ore output of the country. The large consumption of fuel and the more intricate manipulation in the metallurgy of copper, as compared with iron, demand the employment of more labor, and give, therefore, more traffic to the railroads.

As a consequence, three of the trans-continental railroads—the Union & Central Pacific, the Northern Pacific and the Great Northern—derive not a little of their traffic from Butte and its suburbs, with its population of over 47,000 in 1900, which population depends almost exclusively on its copper mines; from Anaconda, which has a population of about 10,000, supported by the concentrating and smelting works of the Anaconda Company, and from Great Falls, with its population of 15,000, relying largely on the copper works of the Montana Copper Company. Keswick, in Shasta County, Cal., the site of the Iron Mountain Copper Company, which makes about 26,000,000 pounds of copper annually, is rated at a population of 2200. And the copper mines of Southern Arizona and Northern Mexico, adjacent to the border, are almost the only means of support of a population of approximately 40,000 souls. It is not possible to determine accurately the freight of all classes which the Rocky Mountain railroads carry in order to supply the demands of the mines and smelters and their workmen exclusive of the transportation of ore, but it is certainly not less than 2,000,000 tons per annum. Approximately 4 tons of fuel are consumed for every ton of copper made, and about 20 feet board measure of lumber are buried underground to each ton of ore extracted. Judging from the consumption of merchandise supplied to a region with which I am acquainted, I would be inclined to calculate the consumption of high class goods by the copper regions of the Rocky Mountains at about 5 tons of merchandise, including mine supplies, per ton of copper produced. In round numbers, therefore, the copper mines of the West supply the trans-continental roads with a long haul on

219,246 short tons of metal.
850,000 short tons of fuel.
130,000 short tons of lumber.
1,000,000 short tons of merchandise and supplies.

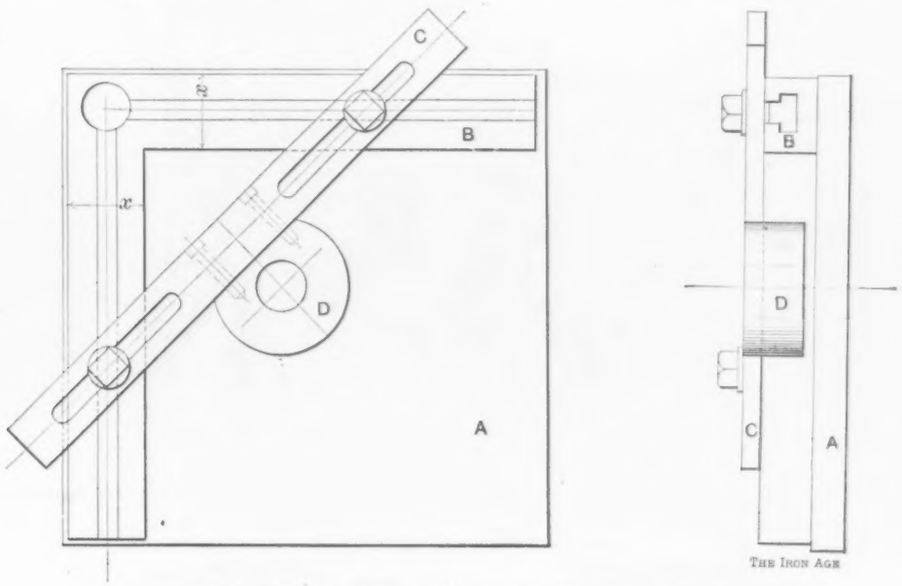
2,199,246

The short haul on ore between the mines and the smelters is many times that amount.

The industrial importance of this branch of national wealth, especially to a region so bereft of agricultural capabilities as the Rocky Mountains, is unquestionable, and its stability has been demonstrated by its survival and growth without such artificial aids as have stimulated the progress of every other branch of the metal trade. For as soon as the products of the copper mines exceeded the home demand, the mines sought a market abroad; and, as there was no combine of any kind, the home price rapidly fell to that of the world's market, despite the protection of a tariff. When, therefore, copper was dropped from the favored list, no effort was made to secure its reinstatement. Nevertheless, perhaps, on this account, during the long period of financial depression after 1893, copper alone, which had received no legislative favors, seemed to feel the stress of hard

times less than even iron and steel. As she had already sought and found a foreign market, this being open to her, she occupied it, no mine closed and no works were shut down. On the contrary the output increased at a higher ratio than it has since. From every point of view, therefore, copper has occupied, and still occupies, a unique position. Will she be able to maintain it?

Mr. Carnegie, in his St. Andrew's address, assigns a life of some 60 to 70 years at present rate of output to the first class ores of our operating iron mines. It would be presumptuous to assign as long a life to the productive copper mines of to-day. The ores of copper invariably decline in percentage in depth, and the mines are being perforated to great depths with such amazing speed that the decline in the value of their ores has been rapid in all our large mines. At the same time, as the ore declines in percentage, improvements in machinery for mining and hoisting and metallurgical handling, and in methods of treatment, have kept such equal pace with the falling off in value of the contents of the ore that none of the big mines has shown evidence of permanent weakness, as displayed by a falling off of dividends or production, or still less of decrepitude. With the assistance of better machinery than even the magnificent engines now used; of long distance transmission of power for employment underground and at surface; the application of economical methods which will reduce the consumption of reagents, use the fuels in the ores and recover more by-products, the day of doom of our large mines existing to-day will be long deferred. Meanwhile, under these very influences old mines are being revived and new ones opened. The statistics of 1901 give as the production of mines outside the three great groups of Montana, Michigan and Arizona, nearly 100,000,000 pounds. The abandoned mines of Tennessee are contributing about 15,000,000 of this amount. California, from her new mines in Shasta County and the old mines in Calaveras County, is sending into the market 35,000,000 pounds. Utah, from the Wasatch range, is making over 20,000,000 pounds. Colorado, though she has discovered no large mines, is subscribing to the fund about 10,000,000 pounds, as a by-product from her smelting works. The same betterments and improvements which will prolong the life of the existing mines will permit such low grade deposits as are known to exist throughout the length and breadth of our land to be utilized, and therefore it will be many a day before our pre-eminence as a copper producer will be seriously challenged. But, with all the improvements and inventions we can conceive of, it will be impossible to make copper as cheaply from very low grade ores as from high, and therefore copper cannot fall in price to the level of an inferior metal. Nor is any other metal likely to seriously supplant it. Apart from the value of copper to the electrician, it is indispensable to the machinist and the railroad. It is so indispensable that a curious parallelism, which cannot be accidental, exists in the world's demands for iron and copper. During the closing half of the century just passed, a period distinguished by the development of the railroad and the replacement of hand labor by machinery, the world's consumption of both copper and iron has increased about tenfold. And the consumption has been so accurately met by the world's demands that neither metal has ever accumulated in any large quantity. During the same period our proportionate contribution of copper has been greater than has been our proportionate production of iron, but we have thus nevertheless simply maintained the balance. During the same half century our railroads increased their mileage 22.5 times, and our blast furnaces increased their production in approximately the same proportion, or 24.4 times. To human progress, therefore, along these material lines, a certain rate of increase in the production of the useful metals and a certain ratio of production between them would seem to be necessary, and, if necessary, it will be maintained.



MASTER JIG FOR DRILLING HOLES IN JIGS.

Master Jig for Drilling Holes in Jigs.

BY C. L. G.

The accompanying drawing illustrates a fixture by which holes may be located with rapidity and within very close limits in plain plate jigs, and is being used successfully in connection with a universal miller with vertical spindle in one of the largest shops in the East.

Referring to letters on the drawing: A is a flat plate which must be planed true; B is a square provided with a T-slot groove; C is a bar for holding the ground bushing D. The outer diameter of the bushing D is ground to exactly 2 inches diameter. The dimension x on the square B is exactly 1 inch.

Work in which holes are to be located is fastened to the plate A, and the bushing D is brought directly in line with the various holes to be drilled by means of micrometer measurements between the edge of the bushing D and the square B, these measurements being taken at right angles to each other, either from the inner side of the square and bushing or the outer edges, according to which is most convenient. The workman takes into consideration in making measurements one-half diameter of the bushing D and the width of the square at x. A standard set of bushings can be made to suit various diameters to be drilled. It is evident that this method of locating holes does not possess the refinements of means employed on some elaborate jigs,

but has been found sufficiently accurate for most machine shop jigs.

The Advances in Molding Machinery.

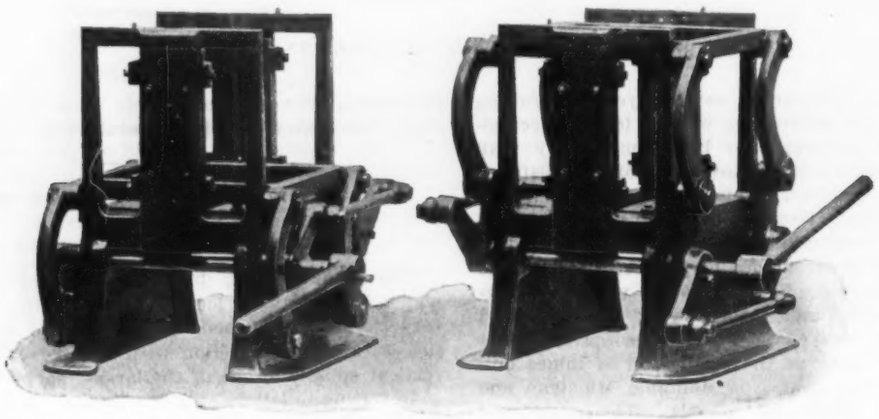
BY HARRIS TABOR, ELIZABETH, N. J.

An investigation of successful manufacturing nations will show that, next to natural resources, an intelligent and well defined system is the underlying cause of any marked success such nations may have attained; this applies to individual manufacturers as well. When Great Britain led the industrial world in iron, steel and textile goods, her systems and methods, which would seem crude and out of place to-day, were undoubtedly far in advance of all competitors; and her machinery was also superior. These qualifications, backed up by her wonderful resources and dogged determination to outdo her rivals, made her the recognized workshop of the world. For generations she easily held this position. It was only when other countries, and notably the United States, began to organize and systematize their worshops that England had competitors. The nations which have been most thorough in this are easily in the lead to-day, with our country holding the commanding position, much of its gain having been made within the present generation.

Our almost unlimited resources in the way of minerals have, of course, made our manufacturing growth possible, but the fact that these natural resources have always been with us is evidence that the improvements within the vision of this generation have been assisted by other causes, such as systematized action, organization, adoption of labor saving devices and machinery and a disposition to lead at all hazards. This is well illustrated by the statement attributed to Andrew Carnegie: "If I had to give up all my plants and machinery, and could retain my organization and system, I would be running again within four years better than ever."

The methods and machinery of such men as A. L. Holley, Capt. Wm. R. Jones, Julian Kennedy, Charles M. Schwab and S. T. Wellman, in the iron and steel industries, have turned the minerals of this country into a wealth undreamed of a generation ago. The wonderful work of these men was made possible by our manufacturers and artisans. When William Sellers & Co., Brown & Sharpe and Pratt & Whitney began the use of the jig and gauge systems they inaugurated a new method of manufacture whose potent influence extends all over the world. This was the beginning of organized

Farwell Hand Lever Press for Molding Light Gated, Plated and Stripping Plate Work, by the Adams Company, Dubuque, Iowa.



Hand Ramming Stripping Plate Machine with Multiple Shafts for Drawing Patterns, by Henry E. Pridmore, Chicago.

and systematized manufacture of duplicate parts. The Waltham Watch Company revolutionized another industry when they introduced machinery for turning out all the delicate parts of the pocket time piece and thus made it possible for the poorest laborer to carry the time of day with him.

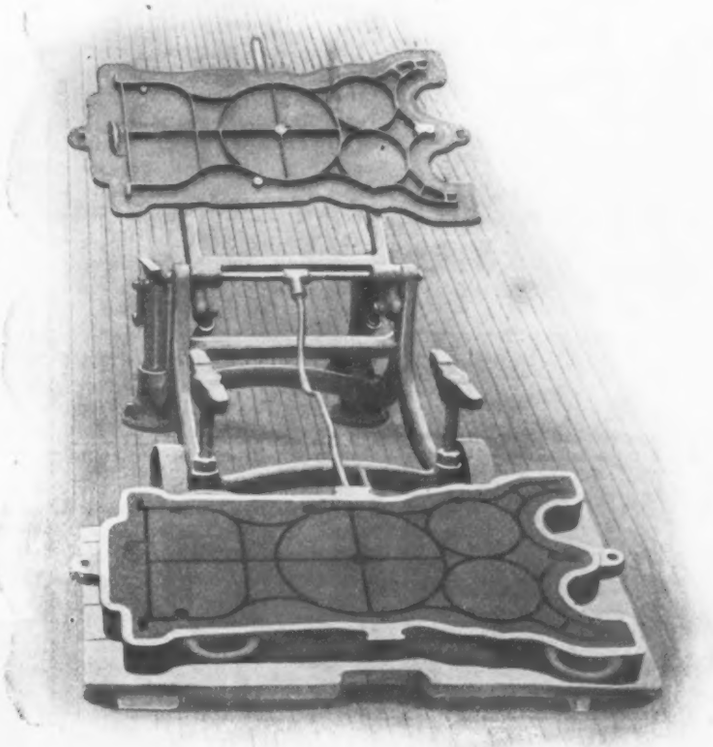
The modern American methods of manufacture are built upon organized efforts to adopt everything in the way of system and machinery that tends to produce a better and cheaper product; and at the same time to dispense with that maximum of mechanical skill which is so difficult to obtain in times like the present. In the foundry, this has been greatly helped by the use of molding machines; and as these machines are more generally adopted we shall see the efficiency of the foundry increased.

The Origin of the Molding Machine.

It is difficult to trace the origin of the molding machine—that is, of the successful use of such machines. The English, German and American patent office records show grants to inventors in this line long before molding machines had real existence. Many of the designs were wholly impracticable. It is easy to see that lack of attention to details, such as good cores, clean molds, proper pouring, &c., must condemn the best molding machine. In the old days, when prejudice was so strong against all labor saving devices, concerted action on the part of the molders and indifference of the foreman would make the machine a total failure, or reduce its output to that of an ordinary molder. Probably such disposition on the part of the English molder is responsible for the fact that this country, more than any other, has developed the modern molding machine and insured its success. At any rate, the beginning of the twentieth century finds such machines in more general use in the United States than elsewhere, and they are turning out more difficult castings. All indications point to a more extended use.

Improvements on Old Molding Methods.

The old method of molding, which is still in vogue in some countries, was to bed the lower or drag portion of the pattern in the sand and build up the joint of the mold along the parting line, regardless of cost in time and labor. The man who devised the follow board, which shuts off the upper or cope part of the pattern at the joint line, thus eliminating the cost of making the parting of the mold, introduced a systematic saving which is still followed; and he who split the solid pattern in two became a benefactor quite as great. Where more than one pattern was grouped in a flask or molding box, the custom was to mold and draw these patterns separately, thus entailing much needless work. Some man, brighter or more ambitious than his fellows conceived the plan of matching these patterns on a plate—that is, putting a plate between split patterns and making the plate a molding board. Here was an improvement which gave, in effect, only one pattern where a number had been molded before. The man who conceived the match plate system still depended on the molders' skill and time to cut the running gates; and the glory of making gate patterns and attaching them to the match plate was left to some more progressive man, who possibly belonged to a succeeding generation. A large number of castings, such as have irregular parting lines and others which require absence of the parting line mark, are not suited to the match plate system; these were molded detached and were drawn separately, and still are now, where the numbers do not warrant the cost of "gating." Away back somewhere in the history of molding may be found a genius who "strung" these detached patterns on the running gate, and he did a wonderfully clever job for following generations. By attaching each pattern to a branch from the central running gate, he enabled the molder to handle, rap and draw any number of patterns as one. It is this system that makes American malleable iron castings and gen-



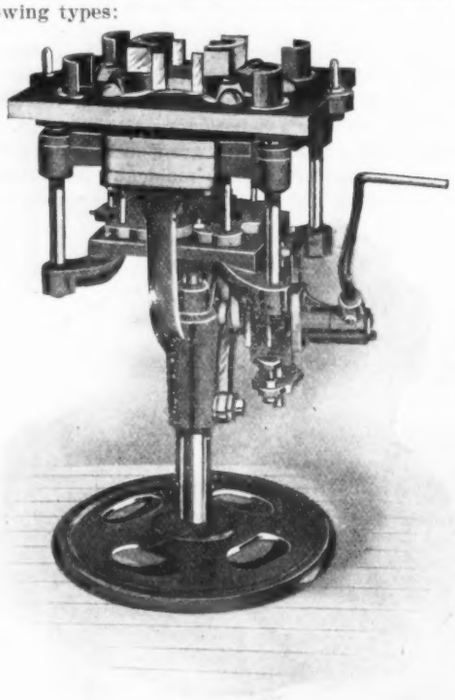
Hand Ramming Rockover Machine for Plated Work, by Henry E. Pridmore, Chicago.

THE ADVANCES IN MOLDING MACHINERY.

eral hardware castings marvels of perfection at less cost than is obtained elsewhere in the world.

Advance to the Molding Machine a Natural Sequence.

The advancement from plated and gated work to the molding machine was a natural sequence, resulting in the following types:



Hand Ramming Stripping Plate Machine for Molding Coupler Knuckles, by Maywood Foundry & Machine Company, Chicago.

1. The hand lever press or "squeezer," on which the ramming of the sand is accomplished by the weight or exertion of the workman on the lever, and which is largely used for molding gated and plated patterns and small stripping plate work.

2. The stripping plate, which, as its name would indicate, surrounds the pattern and supports the sand while the patterns are drawn.

3. The vibrator system, which delicately and rapidly vibrates the patterns during the drawing. These types are shown in the accompanying illustrations of machines produced by the leading molding machine manufacturers.

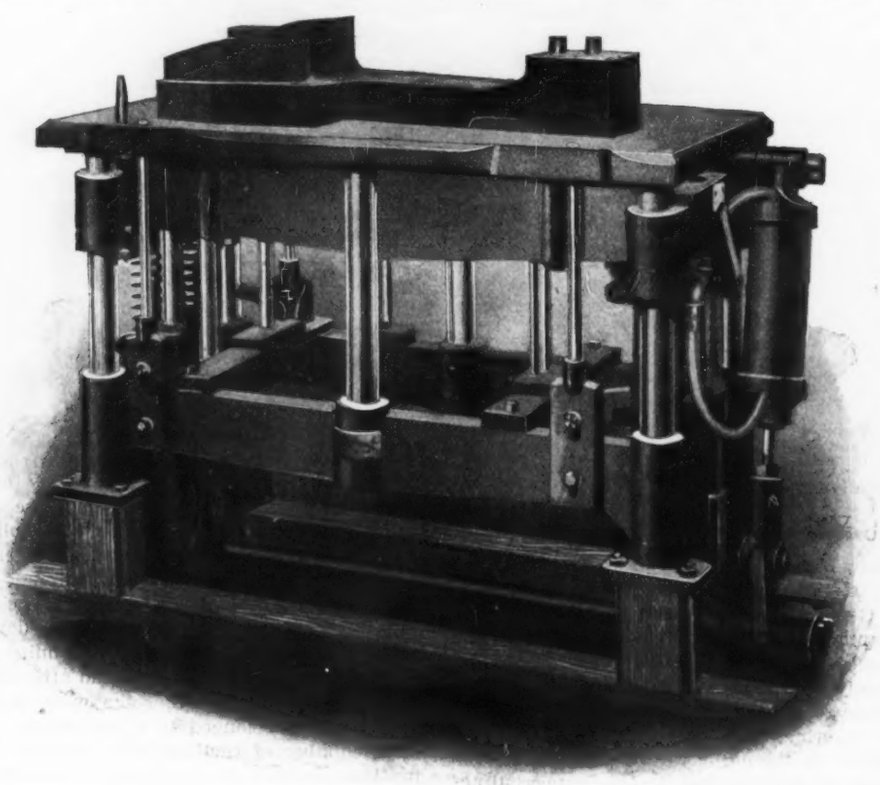
The influence of the molding machine on the modern foundry has been enormous. It has helped to systematize by encouraging the duplication of parts, thus reducing cost and skill and improving quality and quantity in product. Without its help it would have been impossible for many of our foundries to have reached their present high standard and large product, so difficult has it been to get skilled molders within the past few years.

The Future of the Molding Machine

The future of the molding machine promises much to the foundry trade. Each year adds to its possibilities. We already find work that calls for three-parted flasks and patterns with difficult drawback pieces added to its record. Sizes are being increased to mold pieces, which a few years ago would have seemed impracticable. Difficult cored work, such as steam engine and pump cylinders, all classes of valves, steam, water and gas fittings, have gradually left the molder's floor and been transferred to the molding machine with profit and positive relief to the founder.

Trade conditions grow more exacting and are oftentimes burdensome to the manager. The limitations of apprentices that allow one to eight molders are much too severe. As apprenticeships cover periods of three to four years, it will be seen that the proportion of one to eight molders is, in fact, one to 24 and 28; which is much too small to repair the losses in the molders' ranks due to death and retirements from other causes. So long as such conditions in the foundry exist the management must look to unskilled labor for relief, and here the molding machine will prove the strongest ally.

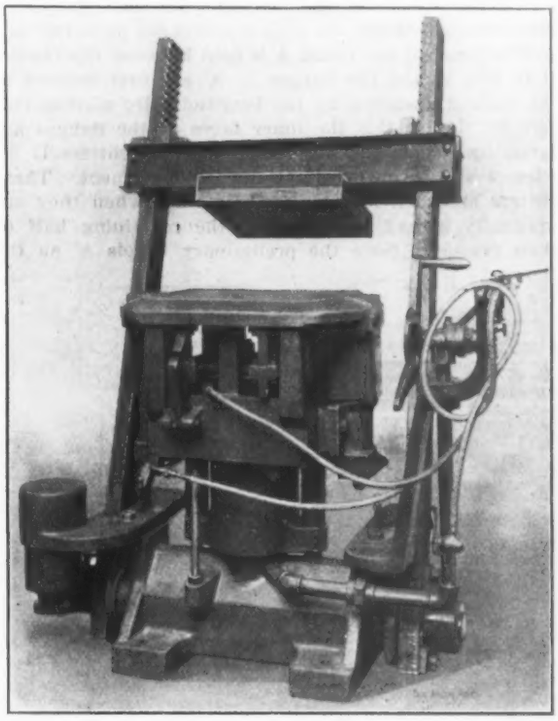
It is doubtful if the foundry has kept pace, in improvements, with kindred industries. The present generation has seen a revolution in machine shop methods



Hand Ramming Stripping Plate Machine for Molding Jánney Type of Draw Bar, by Maywood Foundry & Machine Company, Chicago.

THE ADVANCES IN MOLDING MACHINERY.

and in rolling mill practice, all tending to better and cheaper production. The next generation will see quite as radical changes in our foundries, and the results will be as far reaching. The more general adoption of the molding machine and labor saving devices will place the



Power Ramming Split Pattern Vibrator Molding Machine for Molding Plated Pattern and Stripping Plate Work, by Tabor Mfg. Company, Philadelphia.

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foundry in the front rank of our industries with decided benefit to employer, employee and customer.

The Efficiency of Steam Engines.—Professor Carpenter has made the following comparison between engines, so far as efficiency is concerned:

	Pounds of coal per horse-power.	Efficiency. Per cent.
Simple, noncondensing, throttling	5	4.3
Simple, noncondensing, automatic	4	5.3
Compound, condensing, slide valve	3	7.1
Compound, condensing, Corliss	2½	8.5
Compound, condensing, Corliss	*2	10.6
Triple, condensing	2	10.6
Triple, condensing	*1¾	12.2
Quadruple, condensing	1 2-3	12.7
Quadruple, condensing	*1½	14.1

* The usual best results.

In this table 1 pound of coal is considered as furnishing 12,000 B. T. U. With natural gas his figures for gas engines are:

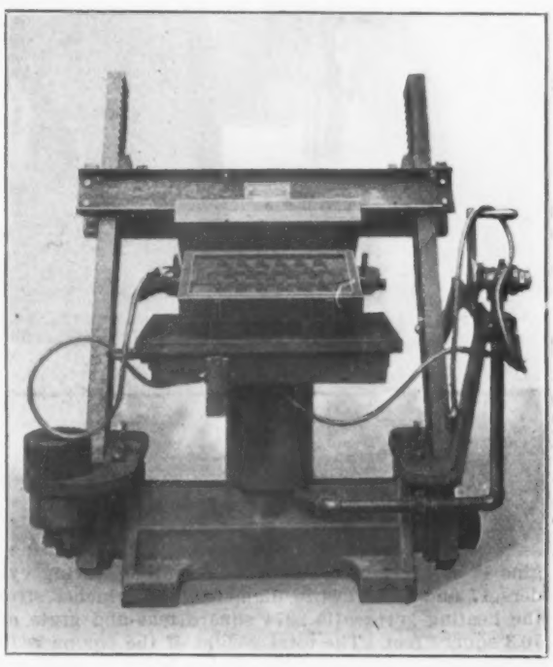
	Efficiency. Per cent.
10 horse-power	15
50 horse-power	20
100 horse-power	24
600 horse-power	27
800 horse-power	28

According to information published by the United States Treasury Department Bureau of Statistics, there are 1750 submarine telegraph lines in the world, the aggregate length of which is nearly 200,000 miles. The number of messages annually transmitted over these lines exceeds 6,000,000.

According to figures collected by the *Financial Chronicle*, 35 cotton manufacturing companies of Fall River, R. I., with a capital of $21,411,000, paid dividends aggregating $1,368,400 in 1902, equal to 6.47 per cent. The best year since 1889 was the year 1900, when 35 companies distributed 9.97 per cent. In 1901 the average was 5.53 per cent.

London Bridge, which has stood in its present form for nearly 800 years, is to be widened to accommodate the constantly increasing volume of traffic across it. Attempts have been made, by the construction of other bridges, to relieve the pressure, and the Tower Bridge, only recently completed, was one of these. None, however, seems to be so conveniently near the great avenues of commerce served by the bridge, and the congestion on the historic structure has become so marked that it is found necessary to add 11 feet 6 inches to the width, which, as originally built, was 53 feet 6 inches between the parapets. Of the addition, 2 feet 6 inches will be absorbed by the roadway, and 4 feet 6 inches in each of the two foot paths, where the congestion is most apparent. This makes the latter 14 feet wide, as compared with 9 feet 6 inches in the original bridge.

Several large electric power plants are under way at various points along the Susquehanna River, in the vicinity of York, Pa. At Conowingo Falls a 35,000-horse-power power house is under construction, from which power will be transmitted to Wilmington, Del., and to Chester, Pa. A 40,000-horse-power plant is to be built



Power Ramming Machine for Molding Gated Work in Vibrator Frame and Plated Work, by Tabor Mfg. Company, Philadelphia.

THE ADVANCES IN MOLDING MACHINERY.

at Peachbottom, the power from which will be transmitted to Baltimore and intermediate points, and surveys are in progress at York Furnace for another plant of similar capacity.

A compilation of figures, approved by well informed financial officers of several large railroad systems, shows that within the past 18 months increases in the pay of railway employees in the United States have been made aggregating considerably more than $42,000,000. The wage increases already made embrace about two-thirds of the 200,000 miles of American railroads. Several roads are now revising their wage scales to meet the general demand for an advance, and it is estimated by expert railway accountants that the railroads will enter

upon the new year with not less than $50,000,000 added to their payrolls.

The Lot's-road generating station at Chelsea (England) is to be equipped with steam-turbo-generator units of 8000 horse-power capacity, which, curiously enough, are to be "built partly in Pittsburgh, but will be finished at the works of the British Westinghouse Company, at Trafford Park, Manchester. Mr. Yerkes has stated that the Lot's-road station, though of much greater capacity than the Glasgow tramway generating station, will cost only two-thirds as much, and part of the saving is without doubt due to the adoption of the steam turbine."

A recent haul of a six-coupled locomotive on the Lehigh Valley Railway consisted of 104 cars, weighing in the aggregate 4013 tons. The run made was 82.5 miles, which was covered in five and one-half hours. The engine is a Vauclain compound locomotive, having cylinders 17 and 28 inches in diameter, by 30 inches stroke; the heating surface is 2974 square feet and grate area 76.3 square feet. The total weight of the engine is 197,500 pounds, of which 171,000 pounds, being located on the drivers, is available for adhesion.

Active measures are being taken to establish a marine experimental tank in connection with the National Physical Laboratory of England, and to carry on experiments testing the models of ships as part of the duties of the scientific staff of that institution. The Institute of Naval Architects has taken the matter in hand, and the subscriptions asked for are being obtained. It is estimated that about $75,000 will be required to construct and equip the tank.

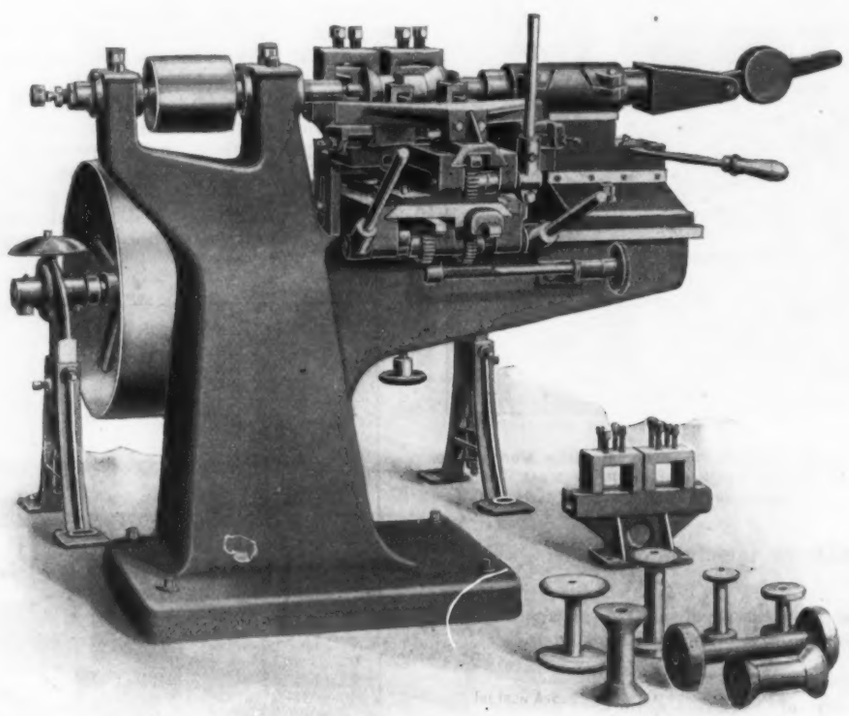
The ore dock of the Wisconsin Central Railway at Ashland, Wis., was destroyed by fire recently, entailing an estimated loss of $500,000. The dock was one of the largest in the Northwest. The loss included 9000 tons of ore, as well as the ruin of the entire dock.

The ore docks at Escanaba, Mich., of the Peninsula division of the Chicago & Northwestern Railway Company handled during 1902 4,756,266 gross tons of iron ore.

The Defiance Spool Turning Lathe.

The spool turning lathe designed recently by the Defiance Machine Works of Defiance, Ohio, is intended for turning spools of different kinds and sizes, including the warp and taper head thread spools. It receives the spool blank, rounds the flanges, finishes the sides and trues the barrel complete.

The roughed out blank A is held between the centers B C, Fig. 2, and the flanges A' A^2 are first reduced to the desired diameter by the longitudinally moving cutters D'. After this the inner faces of the flanges are faced by a pair of transversely moving cutters E E', Figs. 2 and 5, during their inward movement. These cutters are then backed out half way, when they are gradually spread apart during the remaining half of their travel to form the preliminary bevels A^3 on the flanges. The cutters then return to their first position and again run in, but without doing any work, until they reach the spindle A, after which they are again gradually spread apart during their entire backing out movement and thus finish the bevels A^4, Fig. 6. The cutters F F^2 are simultaneously run in from the back of the machine to finish the outer faces of the flanges and reduce the spool to the desired length. At the same time the cutters F' F^3 finish the peripheral faces of the flanges.



THE DEFIANCE SPOOL TURNING LATHE.

The longitudinally movable cutters are placed under the spool and secured to tool posts, which are lengthwise adjustable on a slide mounted in guides of a frame I, Fig. 3. These guides are vertically adjustable on an auxiliary bed by a screw rod. By this means the cutters can be brought nearer to or farther from the spool flanges as may be desired. These cutters are so arranged as to be moved into working position by the hand lever shown at the right in Fig. 2.

The cutters E E' are held in tool posts fulcrumed on the cross heads J J'. The tool posts are swung into the proper position to bring the cutters in true transverse alignment, as shown in Fig. 4. The cross heads are mounted to slide on saddles K, and their inward movement is limited by adjustable stop bolts. The carriage L is run inward by means of the lower rack and pinion shown in Fig. 3, in order that the cutters E E' may

turn the inner faces of the flanges. The cutters are then withdrawn about half the distance of the depth of the flanges and are then spread apart to trim off the corners of the flanges, as mentioned above. This is accomplished by the following device: On top of the crossheads J J' are journaled friction rollers engaged by channels formed in the under side of the slide N, which is moved on the carriage L by the upper rack and pinion racks are cut from the solid and bronze bearings are employed. The live spindle is of forged steel and rotates in self lubricating bearings made in halves to take up wear, and has a bronze screw at the rear end to prevent end play. The tail spindle is provided with a quick horizontal movement by hand lever to hold or release the work and is self locking when thrown in either direction. The carriage which supports the cutters has

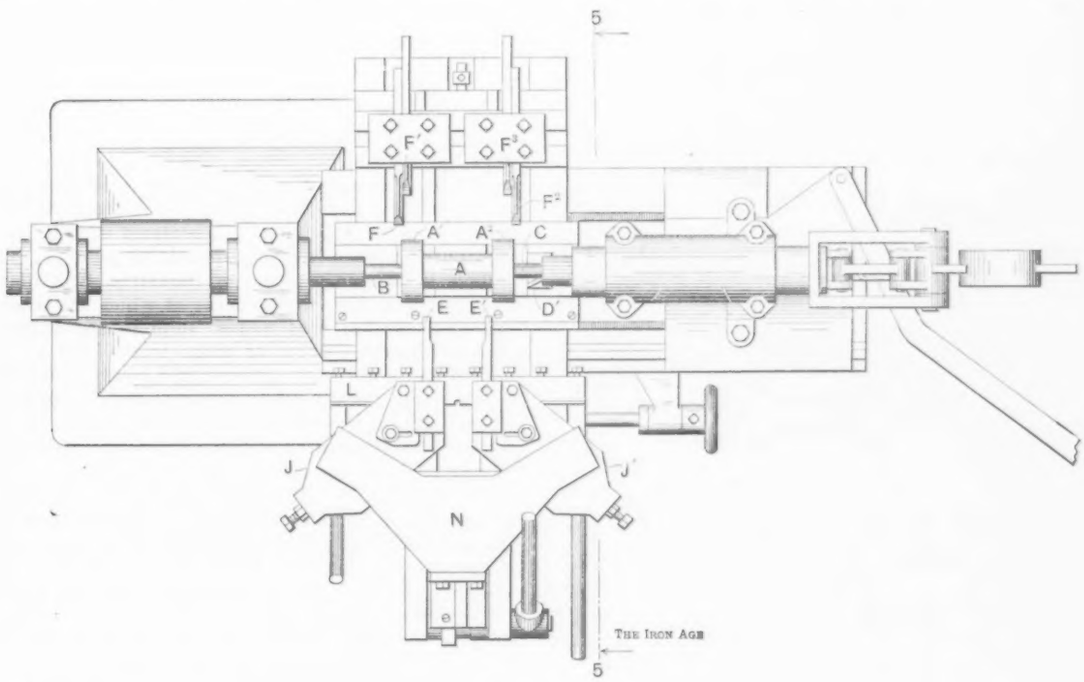


Fig. 2.—Plan.

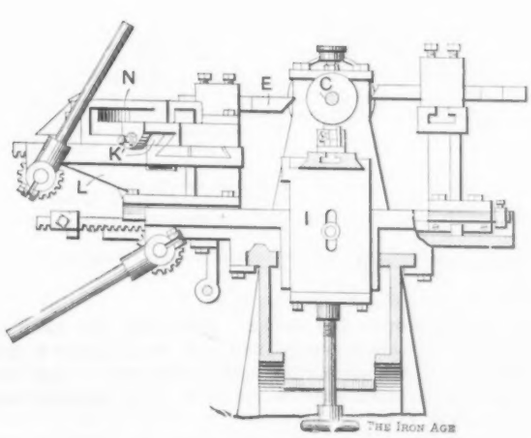


Fig. 3.—Section on 5 5 of Fig. 2.

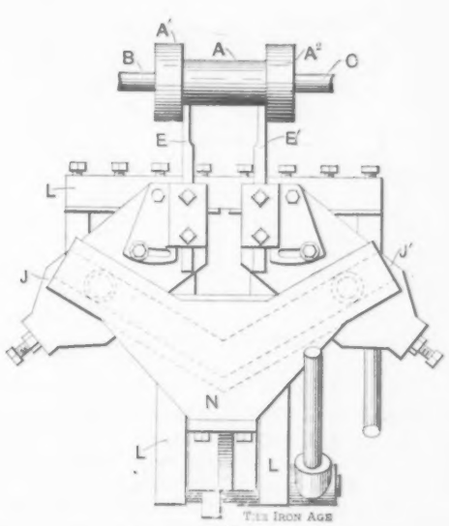


Fig. 4.—Enlarged Plan of Mechanism for Finishing the Inner Beveled Faces of the Spool Flanges.

THE DEFIANCE SPOOL TURNING LATHE.

indicated in Fig. 3. The rollers and their channels are shown by the dotted lines in Fig. 4. It will be understood that when the slide is moved a diagonal movement will be imparted to the cutters and the first bevel will be formed in the flanges of the spool. The positions of the parts at the end of this operation are shown in Fig. 5. The cutters are then advanced to the spindle and again withdrawn to complete the bevels.

The sets of cutters F F² are moved toward the blank by a rack and pinion to finish the peripheral face of the flanges.

The machine is finished with the greatest accuracy, all the sliding surfaces being scraped. The gears and every necessary adjustment and movement to accommodate spools of every size and shape.

Car Building in 1902.—The *Railroad Gazette* reports that during 1902 approximately 164,547 cars have been built, including cars for use on elevated railroads, but exclusive of street and other electric cars. This is considerably the largest record which has ever been made in the country and exceeds by 25,542 the output for 1901. These figures, of course, do not include cars built by railroads at their own shops. Of the cars recorded, approximately 162,599 are for freight service, and 1948 for passenger service, 161,747 are for domestic use, and 2800

are for export. Last year the total number of cars built was 144,267, which exceeded by 20,161 the recorded output for the year 1900. The 1901 figures included also 5262 street cars. Almost all of the figures for both 1902 and 1901 are official, and in the two or three cases where it was necessary to make an estimate the number of cars involved was small, and we were enabled to make a close calculation from our own current records, so that the sum total, as here given, may be accepted as being very nearly correct. The proportion of steel cars and cars with steel underframes to wooden cars will be published in a subsequent issue. It may be interesting also to note that 5561 cars were built during the year by three firms in Canada.

New Railroad Mileage in 1902.

A careful preliminary estimate made by individual canvass of the railroad companies and supplemented by the *Railroad Gazette's* own records, figures furnished by the State Railroad commissions, and other sources of information, shows that approximately 6026 miles of new steam railroad have been built within the United States between January 1 and December 31, 1902. This new mileage has not been exceeded since 1888. The figures are exclusive of second track, sidings and all electric lines. Rebuilt mileage is also excluded, except where the work involved such extensive changes in alignment that a new route was established, as in the case of the Southern Pacific between certain points in Nevada.

The new mileage built in the United States in the years named was:

1893	3,024	1898	3,265
1894	1,760	1899	4,569
1895	1,428	1900	4,894
1896	1,692	1901	5,368
1897	2,109	1902	6,026

Railroad building was reported done in 42 States and Territories, and Oklahoma leads the list with track laid on 570 miles of new line during the year. Texas comes second with 496 miles, Arkansas is third with 371 miles and Indian Territory is fourth with 363 miles. Georgia built 336 miles during the year. In addition to these, Illinois, Iowa, Missouri and New Mexico show returns of over 200 miles limit; and Alabama, California, Florida, Louisiana, Michigan, Minnesota, Mississippi, Ohio, Pennsylvania, Washington, West Virginia and Wisconsin built between 100 and 200 miles. No new steam mileage was reported from Alaska, Delaware, Idaho, Maryland, New Hampshire, New Jersey, Rhode Island or Wyoming.

A Large Power Distribution Scheme in Scotland.

A bill has recently been sanctioned by Parliament which gives authority for an extensive power distribution scheme contemplating the supplying of power to the industrial region of the lower Clyde River in Scotland. The district covered by the bill includes that part of the Clyde Valley extending about 10 miles on each side of the river and about 20 miles up and down stream from Glasgow. The area covered is about 700 square miles, and three generating stations will be erected to meet the demand for power. The scheme has been promoted by a group of manufacturers who desire to obtain cheap electrical power, and who realize that this can be better done by joining in a common system than by each putting down his own generating plant.

This is the busiest part of industrial Scotland, and contains about 1200 works, many of which are large iron and steel works, coal mines, shipbuilding yards and chemical works. Some of these works will alone require more power than many of the local municipalities now provide for lighting purposes, and it was easily shown that it would be inadvisable for the separate boroughs to attempt to supply an amount of power involving so large an expenditure of capital.

The three generating stations are to be built at Motherwell, Yoker and Crookston. The Motherwell station is located in the neighborhood of a large number of manufacturing works and in the center of an extensive coal field and can be connected with the adjoining line of the Caledonia Railway. It is also in close proximity to the river Clyde, from which water for steam and condensing purposes can be obtained.

The Yoker station is also situated on the Clyde, near the line of the Lanarkshire & Dumbartonshire Railway, and is in close proximity to a large number of shipbuilding yards, works and docks. Authority has been obtained to lay cables across the Clyde from Yoker to Renfrew, which will enable the works at Renfrew, and other works on the south side of the river, to be supplied from this station.

The third generating station will be situated near Crookston on the Glasgow & Southwestern Railway Canal Line; but, owing to the arrangement allowing the company to cross the river, it will not be necessary to construct this station immediately.

The works from which the most urgent demands for power have been received are situated in the areas immediately surrounding the first two sites, and it is intended, therefore, to proceed with these stations first and to install in each a plant of about 4500 kw. capacity. They will be so designed that they can be enlarged from time to time, as the demand requires. A radius of 14 miles from these stations covers practically the whole district in which the company will be allowed to distribute their power, but a large proportion of the works are located within a radius of 6 or 7 miles of the stations. When the stations are in operation they will probably be coupled together electrically, enabling them to share the loads and average up their power factors or to supplement or aid each other in any emergency.

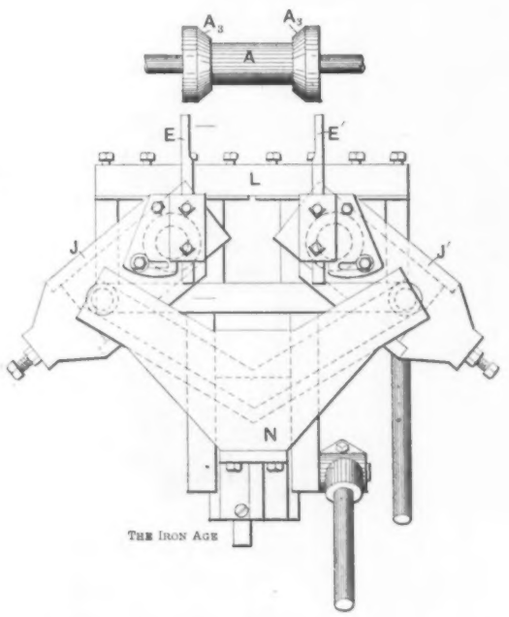


Fig. 5.—View Like Fig. 4, with Parts in Position After the First Bevel Cut Has Been Made.

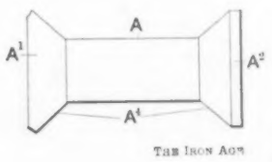
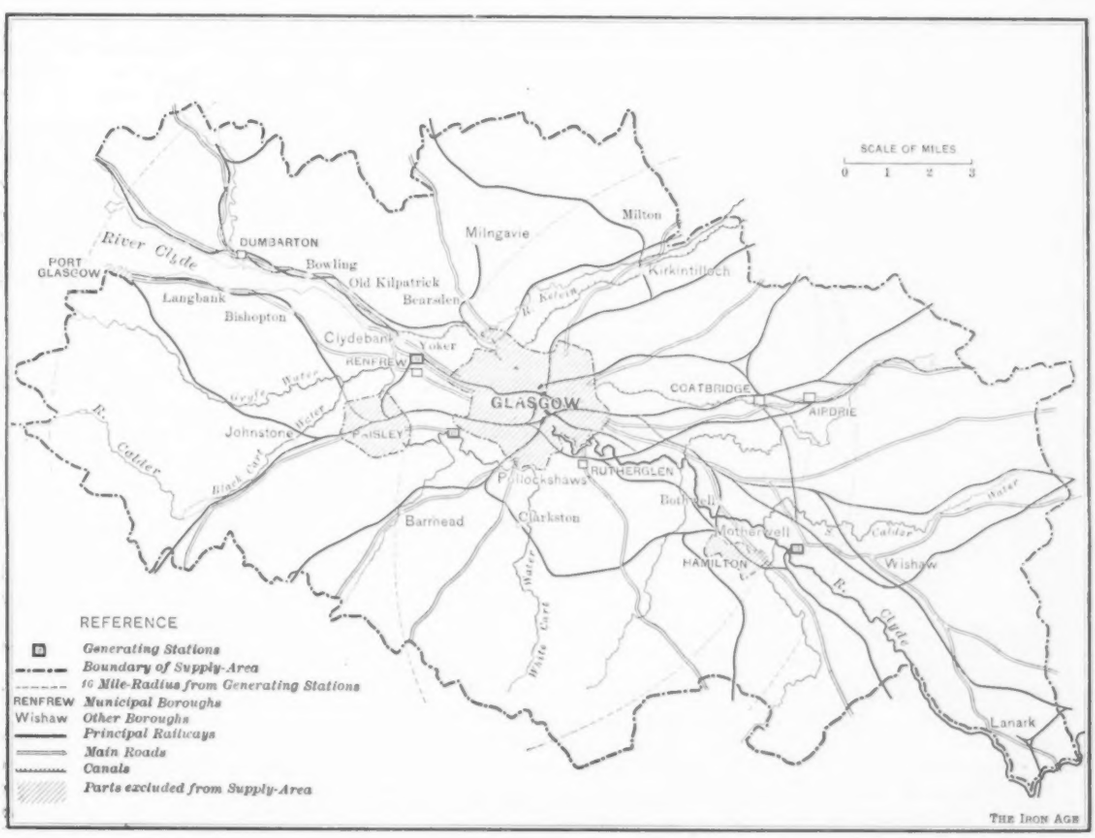


Fig. 6.—Finished Spool.

THE DEFIANCE SPOOL TURNING LATHE.

The capacities of the respective stations will ultimately be about 10,000 kw. each at Motherwell and Yoker, and 5000 at Crookston. By utilizing cheap sites for the stations outside of towns and near to the coal mines, it will be possible to generate power at a very low cost. Of the 710 square miles covered by the scheme, only 13 are at present supplied with electricity. It is said that over 300 manufacturers petitioned in favor of the proposition, and it is thought that many of the remainder petitioned in favor of the rival Caledonian scheme which was turned down. The carrying out of this mammoth scheme of power distribution will place the manufacturers of Glasgow on a footing to be compared to that of American manufacturers who are so fortunate as to be within range of our cheap water powers.

The authorized capital of the Clyde Valley Electrical Power Company is $4,500,000, with borrowing powers of $1,500,000. The total cost for plant on the transmis-



A LARGE POWER DISTRIBUTION SCHEME TO BE CARRIED OUT IN SCOTLAND.

sion lines is estimated at over $2,000,000. The electrical apparatus, which will comprise polyphase alternating current generators and transformers for high voltage power distribution, rotary converters for the supplying of direct current, &c., has been contracted for with the British Westinghouse Electric & Mfg. Company. Strain & Robertson are the engineers of the Clyde Valley Electrical Power Company. Mr. Robertson recently spent a considerable period in the United States investigating our system and methods of power transmission and distribution, particularly in our large cities and in such localities as Niagara, Snoqualmie Falls, Wash.; Canyon Ferry, Mon., and other places.

The International Steam Pump Company.—At a special meeting of the stockholders of the International Steam Pump Company, held in New York, December 23, the following propositions were unanimously adopted: "1. To sanction a resolution passed by the Board of Directors for the issue of $3,500,000 of debentures. 2. To authorize increase of capital stock by the issue of 35,000 additional shares of common stock of the par value of $100 per share, so that the capital stock, as increased, will consist of 185,000 shares of common stock, instead of 150,000 shares, as at present. 3. To authorize the insertion in the debentures of a provision for the conversion of said debentures, or any part thereof, at the option of the holder, into common stock, part of the increased issue to be authorized on a basis of 10 shares of such stock for each $1000 of debentures."

Important researches bearing on the protection from corrosion of the steel framework of modern building have been for some time in progress in Boston. It has been found that moisture and carbon dioxide are the active agents in causing iron to rust. With steel embedded in the walls of a building both of these agents have access to its surface to a greater or less degree, and it has been found that even concrete, in certain cases, has proven insufficient to protect the ironwork from rust. Expanded metal embedded in concrete has rusted wherever the steel was exposed by the cracking of the concrete, even when these cracks were very fine. On testing the efficacy of various kinds of concrete bricks in preventing corrosion from the influence of steam, carbon dioxide and air, it was found that only when the cement was used neat was there perfect protection. When mixed with sand or cinders or both, the specimens were invariably found to be more or less corroded.

Baron von Welsbach, whose name has become a household word through his incandescent gas burners, has invaded the field of electric lighting by introducing the metal osmium as the incandescent metal. Osmium is the heaviest and one of the hardest of metals—harder than glass—and almost always occurs alloyed with iridium, having a melting point of about 4000 degrees F. Its advantage in electric lights is the extraordinary amount of light it gives in proportion to electrical expenditure, and its durability. This is believed to make it especially advantageous for the lighting of cars with accumulator batteries. Its consumption of electricity is little greater for the thousandth hour than for the one hundredth; while certain lamps require 5.2 watts in the thousandth hour, against 2.5 in the first.

The Pittsburgh Iron Trade in 1902.

BY ROBERT A. WALKER, PITTSBURGH, PA.

General Review of Conditions.

In writing a review of the Pittsburgh iron trade of 1901, which was published in *The Iron Age* of January 2, 1902, it was stated that 1899, 1900 and 1901 had been remarkably prosperous years in the iron trade, and to these three years must now be added 1902, which has made as good or an even better record than any of its three predecessors. In strong contrast with 1899, when there was a phenomenal rise in prices, and with 1900, when there was almost as great a recession, the year 1902 has been remarkable for the stability in prices, which has been maintained nearly all through the year, and for the narrow range of change in values. This stability in market prices has been due primarily to two causes: 1 To the price agreements in existence through the year; and, 2, to the commendable policy of the United States Steel Corporation in refusing to advance prices, even when an insatiable demand, shortage in material and general conditions seemed to warrant higher values. The wisdom of this policy has been fully demonstrated, and the iron market has been devoid of the wild fluctuations in prices which were a frequent occurrence before the organization of the Steel Corporation, and which always did so much harm to buyer and seller alike. Consumers have been vastly benefited by this stability since it gave them confidence to place large orders ahead, and thus map out a programme for carrying on business and of dealing with their constituency for long periods ahead. In the matter of profits the year 1902 has been exceedingly satisfactory, the general average of prices being slightly higher than in 1901, while costs of manufacturing have only been a little higher. When it is stated that the earnings of the United States Steel Corporation this year will approximate $140,000,000, it gives to some extent at least a general idea of the earnings of manufacturing plants of all kinds that have modern equipment to manufacture at a low cost. In fact the situation for the first six months of the year was such that it was not a question of price, but of where to find material, and in this condition high prices were obtained by independent makers that meant handsome profits to sellers. Premiums were paid nearly all through the year for quick deliveries of pig iron, steel and nearly all forms of finished material. The tremendous strain of the first seven or eight months was finally relieved to a large extent, and, as a consequence, premiums for early deliveries not only disappeared but it became necessary, on account of increased competition, for leading constituent interests of the Steel Corporation to make lower quotations on wire products, sheets, tin plate and pipe. While these reductions in prices were large in themselves, they did not mean, as has been claimed, that the leading interests were manufacturing these products without profit, but simply that the Steel Corporation was quick to see changed conditions and apply the necessary remedy. Values of iron and steel as they now stand are conservative, with perhaps the exceptions of pig iron and steel, which are relatively higher than the rest of the market. This condition, however, is due to the continued shortage in pig iron, and consequently of steel as well. When the balance sheet for 1902 has been made up, well equipped iron and steel concerns ought to find it a satisfactory one. It will compare very favorably with and probably make a better showing than any of the preceding three years.

The Freight Congestion.

The one thing that has acted against the iron trade during 1902 and which has certainly been felt in the Pittsburgh and Valley districts more than in any other sections of the country, has been the congested condition of the railroad lines. Various causes have been ascribed for this state of affairs, but the real one undoubtedly is that the railroads have not appreciated the wonderful development of the Pittsburgh and Valley districts as iron centers and have failed to keep pace with it. Railroad managers claim, and probably rightly, that they have been doing all within their power for months to relieve the situation, but the great trouble is that they did not take hold soon enough and that they have been swamped with an enormous tonnage, which their motive power and car equipment would not permit them to handle. The Pennsylvania Railroad is an admirably managed institution in a general way, but most of the chief officials do not live in Pittsburgh and have not kept in close touch with the growing needs of this city for increased railroad facilities. The situation has certainly been bad enough, but it would have been much worse had it not been for the keen foresight of Andrew Carnegie and his associates, who saw what was coming and built their Bessemer Railroad from Butler to Bessemer, and which has carried for several years the greater part of the millions of tons of ore used by the Carnegie Company. The crying need of Pittsburgh is more railroad facilities, motive power and cars, and yet in spite of this city councils and competing lines have for months been using their utmost efforts to block the Wabash Railroad from coming into Pittsburgh and getting a share of the tonnage which the other railroads have shown conclusively that they are not able to handle. In spite of the hindrances to the Wabash project, there does not seem to be any doubt whatever that this great trunk line will effect an entrance into Pittsburgh. That Pittsburgh is badly in need of more railroads is evidenced by the fact that the Jones & Laughlin Steel Company, at the head of which is B. F. Jones, Sr., that grand old man of the steel trade, are making preparations to build their own line from their own ore docks into Pittsburgh, so as to haul in their own cars and on their own road a part, at least, of the enormous tonnage of ore, coal and other fuel used in the blast furnaces and steel works of this large concern. It does not seem that there can be any permanent improvement in the freight situation in Pittsburgh until we have more railroads, but the fact that the Pennsylvania Railroad and other lines have placed enormous orders for engines, cars and other equipment probably means that some relief will be afforded before long. The pitiable condition has been seen for months past of blast furnaces, steel works and other manufacturing plants in Pittsburgh and the two valleys being closed down for days and weeks at a time waiting for coke and other fuel which the railroads, in their congested condition, could not deliver. It is an absolute fact that within the past four or five months only three or four blast furnaces in the Mahoning and Shenango valleys have been able to operate regularly, because coke could not be had. One furnace in the Mahoning Valley received in a month recently only 77 cars of coke, about a five days' run. To any one who is at all familiar with costs of making pig iron, it can readily be seen what an enormous expense this means to a blast furnace in banking down and waiting for coke to arrive. This state of affairs occurred at a time when prices of pig iron were very profitable, furnaces were sold up for months ahead and could not get coke to make pig iron, which their customers so badly needed. Probably the only unfavorable feature in connection with the recent absorption of the Union Steel Company by the United States Steel Corporation is the fact that the plans of the Union Steel Company for building a railroad from their own ore docks to Sharon and Donora and also from the Connellsville regions to both places, will be abandoned, as there is hardly any probability that the United States Steel Corporation will spend the vast sum of money necessary to build this line to make it a competitor of the Bessemer Railroad. It is probable, however, that a

short branch line will be built from the Bessemer Railroad to Sharon, and ore and fuel for the blast furnaces at that place will be hauled over this branch road. There is also contemplated the building of a short line from the Connellsville region into the Wheeling district. There is no doubt whatever but that all the railroad lines entering Pittsburgh will spend millions of dollars in the next year or two in general betterments, which, of course, is all very good and will help the situation a great deal; but the fact remains that one or two more railroads in the Pittsburgh district are badly needed, and when built will be given sufficient tonnage to make the lines profitable. In order to induce the Wabash Railroad to come into Pittsburgh, about the last thing Andrew Carnegie did before he retired from the steel business was to make a contract with this line, by which it was to be given a part of the Carnegie tonnage. What will become of this contract in the face of changed conditions in the Carnegie steel interests remains to be seen, but it is certain that the Wabash will get a part of the great Carnegie tonnage, simply because the necessity for additional railroad facilities in this city demands it.

New Construction.

The year 1902 has seen unprecedented activity in the building of new blast furnaces, steel works, sheet and tin plate mills and smaller manufacturing plants. The chief causes for this remarkable activity in building of new plants were the very large profits to be made in iron and steel manufacturing, and also the fact that consolidations made in the last two or three years had released many persons who were formerly actively engaged in iron and steel manufacture, but who had sold their plants to large interests and found themselves with ample financial means seeking investment. The Pittsburgh district has not been behind in the building of new plants, as is shown by the fact that within the past year there have been erected in this city a number of large iron and steel works, some of which are in operation and others are being hurried to completion as fast as possible. Among these may be mentioned the new plants of the St. Clair Furnace Company and the Clairton Steel Company. The former had under erection for some months at Clairton a model blast furnace plant to consist of three stacks, each with a daily capacity of about 500 tons, and the latter company an open hearth plant to consist of 12 50-ton furnaces. None of these blast furnaces are yet finished, but one stack will be ready early in the new year and the other two about the middle of the year. The open hearth plant is nearly completed, and at present eight furnaces are running, making 600 to 700 tons of open hearth steel daily. The other four furnaces will be started very early in the new year. Plans for extensive additions to the plant of the Clairton Steel Company are under way, and it is not improbable that next year a Bessemer works will be added. It is also likely that the company will build finishing mills for rolling plates and structural steel, and a rail mill is not among the impossibilities. Both these plants are owned by the Crucible Steel Company of America, the idea primarily in building blast furnaces and steel works being to furnish steel to the finishing mills of the Crucible Company.

The Pittsburgh Steel Company, at the head of which is Wallace H. Rowe, long identified with the rod and wire trades, have completed a model plant at Monessen, embracing rod, wire and wire nail mills. The plant has a daily capacity of about 500 tons and is in full operation, the rod mill having been started recently. The concern lacks a steel works, but plans are under way by which at least two blast furnaces and a large open hearth plant will be built at Monessen, to furnish steel for the finishing mills.

Much has been published recently in regard to the new plant of the Union Steel Company at Donora, it having been brought into special prominence by its sale to the Steel Corporation. The present works, completed and in operation, consist of rod, wire and nail mills, but there are under way two large blast furnaces, with a daily capacity of about 500 tons each, work on which is well along and the furnaces and steel works ought to be ready for operation early in 1903. It is probable that two more blast furnaces and 12 open hearth furnaces will be added when the present ones have been completed.

The Carnegie Steel Company have, as usual, been active in making enlargements and additions to present works and building new plants. This company completed early in 1902 a large open hearth plant at Duquesne, a bar mill with a daily capacity of 800 to 1000 tons and a blast furnace at Bessemer, which was built complete in six months. A similar stack is now under way at Bessemer and a larger furnace at Rankin, both of which will be completed by April or May of next year. The Carnegie Company have also very materially increased their capacity by adding new equipment and making betterments wherever these were possible.

At Youngstown, Ohio, the Youngstown Iron, Sheet and Tube Company completed a model plant this year for the manufacture of iron sheets and tubes and which has been in successful operation for some time. This company also took over blast furnace at Sharpsville, and broke ground recently at Youngstown for an open hearth plant, to contain eight 50-ton furnaces. Other smaller interests at Youngstown have built manufacturing plants during the year, among these being the Niles Sheet Steel Company, who have a very complete sheet mill at Niles, and the Empire Iron & Steel Company, who also built a six-mill plant at Niles, located 6 miles from Youngstown. Industrial conditions at Youngstown were never more prosperous than at the present time, and that city has made great strides in the past three or four years as a manufacturing center.

At New Castle, Pa., some small plants were built during 1902, among these being that of the New Castle Forge & Bolt Company, which is soon to be very much enlarged.

At Wheeling, W. Va., the Wheeling Steel & Iron Company have built large skelp and pipe mills during the year and which are now in operation. The La Belle Iron Works, formerly of Wheeling, but now of Steubenville, Ohio, have built in that city a model open hearth steel plant, skelp and plate mills and are rebuilding their blast furnace, which will be ready for blast early in the new year. Also at Steubenville, the Pope Tin Plate Company of Pittsburgh have built a very modern 12-mill tin plate plant, which is now in operation. The tin bars for this plant will probably be furnished largely by the La Belle Iron Works, whose steel plant is nearby. At Sharon, Pa., the Sharon Steel Company, now a subsidiary interest of the Steel Corporation, built four more open hearth furnaces this year, and have nearly completed sheet, skelp and pipe mills. Ground has also been broken by this concern for two more blast furnaces. At other small places, within a radius of 75 miles of Pittsburgh, numerous other works have been built during this year and the activity in building has kept structural shops filled up with work for months ahead. At Leetsdale the Riter-Conley Mfg. Company of Pittsburgh have built large shops for the building of heavy plate work and also for the manufacture of steel barges, the latter of which is a comparatively new industry. At Ambridge, near Leetsdale, the American Bridge Company have under way a bridge works which will be the largest individual plant in the country and a model of its kind. It will include a large modern office building to contain reading rooms, dining rooms, baths and other conveniences for the hundreds of employees of this concern. Building projects were very much delayed during the year by scarcity of labor and inability to get prompt deliveries of structural steel. Had it not been for this the large bridge works of the American Bridge Company, at Ambridge, would be about finished at this time, but they will not be fully completed before next summer. In the Pittsburgh district nearly every manufacturing concern of any prominence has made large additions to existing works. The Jones & Laughlin Steel Company have completed a new bar mill, also a Talbot open hearth furnace, with a daily capacity of about 400 tons, a third 10-ton Bessemer converter, and have under way a 42-inch blooming mill, which will be finished early next year. This company will soon be in position to turn out about 3000 tons of steel a day.

The Labor Situation.

The Pittsburgh district was almost entirely free from labor troubles in 1902, aside from the usual petty strikes which occur at all times, and which seemingly cannot be avoided. Labor has never been as well paid as in the past two or three years, and employers have repeatedly made voluntary advances in wages when conditions warranted. A notable recent instance is that of the Pennsylvania Railroad and lines West, in giving their thousands of employees an entirely voluntary advance of 10 per cent. in wages, effective from December 1. The proposition of the American Tin Plate Company made in the summer to their employees to accept a reduction of 25 per cent. in wages when working on tin plate for export, promised for a time to lead to complications, but after a number of conferences between officials of American Tin Plate Company and the Amalgamated Association, the men agreed to accept a reduction averaging 3 per cent. in wages, to be applied to a fund to enable the American Tin Plate Company to capture the trade of the Standard Oil Company and other large consumers of tin plate used for export, and which trade for years has been held by Welsh mills. The present relations existing between employers and employees were never more cordial, and the outlook is that there will be no serious labor troubles for a long time to come. Employees have commenced to recognize the fact that employers have the interests of their men at heart, and will accord them that treatment in wage and other matters that faithful duty warrants.

Consolidations.

The year 1902 has been freer of consolidations in the iron trade than any of three preceding years. This has been due to the fact that, with the final merger of important iron and steel concerns into the United States Steel Corporation, consolidations had pretty nearly run their course, and also from the fact that the number of enterprises thus launched had been so many and so large that it became almost impossible to finance new ones. For three years past the market has been steadily flooded with iron and steel securities, and the public seem to be getting weary. The Pittsburgh district was practically without consolidations of any kind until December, when the merger of the interests of the Sharon and Union Steel companies was effected. This had hardly been agreed upon and the preliminary papers signed, until the Union Steel Company, which was to be the name of the consolidated interest, was taken over bodily by the United States Steel Corporation. The details of this transaction are still fresh in the minds of our readers and need not be given here. It hardly seems possible that there ever will be again a consolidation in the iron trade as large as that of United States Steel Corporation, but it seems certain that smaller concerns may find it of mutual advantage to combine interests in order to present a stronger organization and effect savings in operation, which past consolidations have proven conclusively can be made. The United States Steel Corporation, controlling as it does more than 60 per cent. of the entire output of pig iron and steel in the United States, and a larger percentage in some lines of finished iron and steel, will continue to expand steadily, so that it is practically impossible that any one concern can approach it in magnitude. The Steel Corporation may deem it expedient at some time in the future to take over rival steel concerns just as it did the Union Steel Company, but any new interest to get into the steel business on a basis that would make them a formidable competitor of the Steel Corporation would have to start in by building at least one railroad, owning their own ore mines, boats to carry this ore, have their own coal properties for making coke and erect blast furnaces and steel works. A project of this magnitude means the expenditure of so many millions of dollars that capitalists who might have the means to so equip a new enterprise would think very seriously before investing their money in it. It is becoming more and more apparent every day that the steel business of this country is to be controlled for the next few years at least by the large concerns that are in existence to-day, having back of their blast furnaces and steel works ore and coke properties and other facilities that make their position almost impregnable. First and foremost of such concerns is the United States Steel Corporation, and then follow interests like Jones & Laughlin Steel Company, Republic Iron & Steel Company, Colorado Fuel & Iron Company, Cambria Steel Company, Pennsylvania & Maryland Steel Company, Lackawanna Steel Company and perhaps half a dozen other concerns, these controlling at least 90 per cent. of the total output of pig iron and steel in this country. As long as the conservative policy which has marked the operations of the United States Steel Corporation since their inception continues, that splendid organization will be in the future as it has is in the past, a distinct benefit to the steel trade of the whole country.

Price Agreements.

In the year 1901 there were in force price agreements on rails, plates and structural material, and to these were added early this year price agreements on iron and steel bars. These agreements have been of great benefit in the fact that large interests that were in control of the situation refused absolutely to make advances in prices, especially early in the year, when conditions seemed not only to warrant, but to demand them. The price of rails has been held steadily at $28 a ton, a figure satisfactory to the railroads, while beams and plates have been held at 1.60 cents at mill, right through the periods when $5 to $10 a ton more could just as easily have been obtained. The wisdom of this conservative policy in the matter of prices has been thoroughly demonstrated by the fact that the output of steel rails this year will be at least 2,800,000 tons, while for months past the plate and structural mills have been congested with orders and already have enough business booked to insure practically full operations for all of next year. It was figured out that to keep prices of these commodities on an equitable basis would result in an enormous consumption, and records for this year show that this was the correct view of the matter. That this same conservative policy will prevail in 1903 is certain, and already the plate and structural agreements have been renewed for 1903 on practically the same basis as before. Already there have been booked enough orders to fill the mills up to September, 1903, and at $28 a ton the mills will be able to make very large profits. The price of steel bars has held steadily through the year at 1.60 cents, and consumers have apparently been well satisfied. In fact, no ground for complaint against price agreements can be found when they are conducted in the conservative spirit that prevailed during 1902, and which leading interests will certainly insist upon as long as they have the power to do so.

Export and Import Trade.

It is almost useless to devote any space in this review to the export trade, as our exports in 1902 of pig iron and most forms of finished iron and steel were practically *nil*. On the contrary, this country has been a very large customer of Germany and England in the purchase of pig iron and billets and hundreds of thousands of tons of these products have been imported this year. A few years ago, when the domestic iron trade was in a depressed condition, we depended on foreign countries to take our surplus product and a heavy export trade was done by leading manufacturers. However, the unparalleled prosperity in the iron trade in the last four years has completely reversed the situation, and aside from the small tonnage of pipe, nails and wire, and some few lines of finished articles, this country is practically out of the export trade for the present. The prospects are that heavy imports of pig iron and steel will be made into this country in 1903, as it does not seem that our productive capacity in the first three or four months at least will meet the home demand. This is particularly true of rails and already a number of Southern and Canadian roads that usually get their requirements from American mills have placed orders for 1903 with foreign makers, the domestic mills not being able to make deliveries wanted. An interesting matter that came up this year was the attempt of the appraisers to increase the duty on foreign billets

from $6.72 to $8.96 a ton. After a number of hearings were held, at which testimony was given by some of the largest importers, notably Naylor & Co., Milne & Co., A. M. Crane & Co. and others, the duty was allowed to remain at $6.72 a ton. A striking feature in connection with heavy imports of iron and steel into this country is that a number of prominent foreign mills are carrying advertisements in our trade papers, soliciting American trade. The iron trade in Germany, and in England as well, has been very much depressed for some time, and it would have been much worse had it not been for the heavy orders of material placed with mills in these two countries by American consumers. Domestic manufacturers dislike to see foreign material coming into this country, but the enormous demand this year, coupled with the inability of the American mills to make deliveries, made it an absolute necessity for buyers to place orders abroad.

Foreign Visitors.

The above is an unusual heading to incorporate in a review of the iron trade, but it is done here for the purpose of calling attention to the unusually large number of engineers and manufacturers from England, Germany, Belgium and other countries who came over to this country in 1902, for the purpose of visiting our iron and steel plants. These visitors were accorded every facility consistent with good business principles to inspect American iron and steel plants, and they have been amazed at the wonderful development and equipment in labor saving appliances and methods in use in American furnaces and mills, by which such enormous records for output have been made. A few years ago a gentleman from this country made a statement before the British Iron and Steel Institute that an American blast furnace had turned out over 700 tons of pig iron in 24 hours. The statement was received with derision, and the author of it was charged with liberal stretching of the truth. Personal inspection of many of our modern blast furnaces, steel mills and other manufacturing plants have convinced our foreign friends that 700 tons a day is not an unusual record for an American blast furnace, but on the contrary it has been exceeded repeatedly. The world recognizes the fact to-day that the United States is far ahead of any other country on the face of the globe in the manufacture of iron and steel and is destined to occupy this proud position for an indefinite length of time.

Outlook for 1903.

The condition of the iron trade at the close of 1902 was about the same as in 1901, and all indications point to wonderful activity in all branches of the trade for the first six months of 1903, and probably for the whole of the year. In support of this prediction it is only necessary to refer to the fact that our blast furnaces have much of their output for the first six months under contract, rail mills have about 2,000,000 tons of new and old orders for 1903 delivery, structural mills are practically sold up for first six months and some of the larger plate mills for all of 1903. In other forms of finished material, such as tin plate, pipe, sheets, bars and wire products, the tonnage booked for 1903 is not so heavy, but it will compare very favorably with other years. The cost of manufacturing in 1903 will be higher than in 1902. In the item of coke alone prices will be from $1.50 to $2 a ton more; ore will probably be higher and the general average of wages will be slightly increased. There need be no forebodings as regards 1903, for barring financial panic, war or some other unusual disturbance, the iron trade for the new year promises to make as good a record as has been made in the four preceding years.

Pig Iron.

A marvelous record in the pig iron trade was made in 1902, the output having been very much larger than in 1901, and it would have been even much greater had it not been for the inability of the furnaces, mostly in the Central West, to get coke promptly. There has been a heavy demand for pig iron all through the year and at prices that gave the operators of furnaces very large profits. On January 1, 1902, there were in blast in the United States 286 blast furnaces, with a weekly capacity of 298,460 tons. The total output of pig iron in the United States in 1901 was 15,878,354 gross tons, including spiegel and ferromanganese. The total output of pig iron for first six months of 1902 in this country was 8,808,574 gross tons. The figures for the last six months of 1902 are not yet available, but the output was somewhat larger than in first six months, and the total output of pig iron for the year 1902 will possibly reach 17,600,000 tons, and it may slightly exceed that amount. The Pittsburgh district continues to be the leading producer of pig iron, making about 35 per cent. of the total output of the country. The Carnegie Steel Company alone, including the recent Bessemer stack started, now have 20 blast furnaces in the Pittsburgh district, making fully 20 per cent. or more of the entire output of the country. The Jones & Laughlin Steel Company have five stacks which turn out over 800,000 tons a year. When the additional Carrie and Bessemer stacks of the Carnegie Steel Company, the two new furnaces of the Union Steel Company, and the three building by the Clairton Steel Company, all of which will be finished within the first six months of next year, are making iron, the Pittsburgh district will have the proud distinction of making close to 45 per cent. of the entire output of pig iron made in this country. The centering of the pig iron industry in the Pittsburgh district means conclusively that it is without a rival in the manufacture of pig iron at a low cost.

Bessemer.—On January 1, 1902, Bessemer pig iron was firm at $16, at Valley furnace, and about the middle of that month the United States Steel Corporation bought 100,000 tons from the Bessemer Furnace Association, for delivery in second quarter, at $15.75, at furnace, or $16.50, Pittsburgh. Other interests bought a large tonnage of Bessemer iron and sales in January were heavy. On February 1 the total stock of unsold pig iron at all the furnaces in the country was less than 75,000 tons, showing conclusively that our enormous output was going into actual consumption. About February 15 the Steel Corporation came into the market again and bought another 100,000 tons of Bessemer iron from the associated furnaces, at $16, at furnace. At this time demand for pig iron was enormous and prices were steadily advancing. By March 15 Bessemer iron was held at $16.50 to $17, at furnace. Early in April the Steel Corporation, which was short of metal, again entered the market and bought 200,000 tons of Bessemer iron for delivery in last quarter of 1902 and first quarter of 1903, at $16.50, at furnace. At this time small lots of Bessemer iron were being sold at $17.50 to $18, at furnace, and very little was to be had at these prices. When May was reached consumers of iron were falling over each other to place contracts with the furnaces and prices were advancing rapidly. Very early in June the trouble with furnace labor started over the eight-hour a day agitation, but what promised to be a serious strike was very quickly fixed up, blast furnace labor withdrawing their demand, the blast furnace owners giving the men a straight advance of 10 per cent. in wages, which put blast furnace labor higher than it had ever been before. Early in July a scheme was on foot to consolidate the independent furnaces in the two valleys, but nothing came of it. At the close of July the Republic Iron & Steel Company came into the market and bought 30,000 tons of Bessemer iron at $18, at furnace, deliveries being 2500 tons a month all through 1903. This company also placed other contracts for pig iron and bought, all told, nearly 100,000 tons. In August the price of Bessemer iron had reached $20.50 to $21, at furnace. In September the coke situation was so bad that furnaces could not get coke to run and were banking. This caused a shortage in pig iron and prices advanced very rapidly. Consumers were unable to get deliveries, and in September at least 100,000 tons of foreign Bessemer iron were bought for shipment into the Pittsburgh district, one leading Pittsburgh interest taking about 60,000 tons. The coke situation was steadily getting worse and furnaces were paying as high as $8 to $10 a ton for furnace coke for prompt shipment. Early in November Bessemer iron was bringing as high as $23 a ton at furnace for prompt shipment.

Reports were current frequently that the United States Steel Corporation would come in the market and buy a large tonnage of Bessemer iron for delivery in second quarter of 1903, but this proved to be untrue, as the Steel Corporation bought no Bessemer iron at higher than $16.50, at furnace. The furnaces were very much behind on their contracts and the Steel Corporation declined to buy any more iron on this account, and also because of the high prices asked. At the close of the year Bessemer iron for January and February delivery was sold at $22, at furnace, while for delivery in first six months of 1903 $21 to $21.50, at furnace, was quoted.

Gray Forge.—The market on gray forge iron in 1902 was very similar to Bessemer, although the advances in prices were not as large as on the latter. January opened with gray forge selling at about $15.50, Pittsburgh, the demand being good. In the latter part of January forge had advanced to $16, and in February it rose to $17 and was quite scarce at the close of that month. The advance continued steadily until at the close of April forge iron was selling as high as $19.50, Pittsburgh. There was a good demand through May, and smaller lots of forge sold as high as $20. In June there was a very heavy demand, and a leading consumer, presumably the American Steel Hoop Company, bought about 25,000 tons of Southern forge iron at $18.75, f.o.b. cars Youngstown, Ohio. Most of the large consumers were covered at this time, but small lots of Northern forge were bringing as high as $21 to $22, Pittsburgh. There was a good demand for gray forge all through June, and it was scarce at $20.50 to $20.75, Pittsburgh. In July there was a moderate demand and forge was held at about $21, being scarce at that price. In August the general pig iron market was quiet and prices of forge declined, that month closing with Northern iron held at about $20.50, Pittsburgh. Not much tonnage was being sold, as the large consumers were covered. In the last four months of the year there was not much change in the market on forge, the larger consumers being well covered and demand was mostly for small lots. The year closed with forge iron selling at about $20.50, Pittsburgh, with but very little demand.

Foundry Iron.—There was a very wide range in foundry iron in 1902, and in certain periods in the year it was not a question of price, but of where to get iron. Consumers feared that they would not be able to get iron when needed and placed large contracts and at high prices. The year opened with No. 2 foundry selling at $16.50 to $17, Pittsburgh, and there was not much change in prices until March, when No. 2 iron was held at $17.50 to $18, Pittsburgh. Southern iron was held at $12, Birmingham, which, with a freight rate of $4.15, made the price $16.15, Pittsburgh. At the close of March No. 2 foundry iron in this district was selling as high as $19.50 to $20 for prompt iron and $18.50 to $18.75 on long time contracts. At the close of April No. 2 iron was bringing $21, Pittsburgh, for prompt shipment, and some sellers were asking higher prices. At this time a good deal of Southern iron was being shipped into the Pittsburgh market, consumers being unable to place contracts with local furnaces who were sold up for months ahead. At the close of July No. 2 iron was bringing about $22, Pittsburgh, for shipment over the balance of 1902, and at the close of August No. 2 iron was selling at $18, Birmingham, or $22.15, Pittsburgh. There was not much change in the market until the close of the year, when prices eased off to some extent. In October sales of No. 2 foundry iron for delivery in the first quarter of 1903 were made at $21.50, at Valley furnace, equal to $22.25, Pittsburgh. In November No. 2 iron sold at $24 to $25 for prompt shipment and up to $23 for delivery in the first quarter. In December prices eased off slightly, and No. 2 iron was held at about $22.50 to $23, Pittsburgh, for the first three months. The large consumers, however, had bought heavily earlier in the year and their average prices were much lower than were being quoted at the close of the year.

Steel Billets.—The steel market made a record for itself in 1902 in the matter of prices, and there was unusual activity in the building of open hearth plants. There were also additions to Bessemer capacity, the Jones & Laughlin Steel Company adding a third Bessemer vessel, while the Republic plant at Youngstown was practically rebuilt. It is evident, however, that the increase in steel capacity in the future will be in open hearth almost exclusively, as the cost of building an open hearth steel plant is much less than that of Bessemer, and for many purposes open hearth steel is claimed to be superior to Bessemer steel. It is a fact that the Carnegie Steel Company have practically made no increase in their Bessemer capacity for some years, all their new works making open hearth steel. In January the price of Bessemer billets was about $27, Pittsburgh, and our quotations in this report mean f.o.b. Pittsburgh, unless otherwise stated. At the first of the year importations of foreign steel had started, a large interest in the Youngstown district buying 3000 tons of German basic billets at a price equal to about $27.50, f.o.b. cars Youngstown. At the beginning of February the shortage in steel was being severely felt, and Bessemer billets for prompt shipment were bringing $28.50 to $29, and basic about $30. At the close of February prompt Bessemer billets were bringing $30, and were very scarce. In March Bessemer steel had advanced to $31, and at the close of that month as high as $32 was being paid for steel for prompt shipment. Open hearth billets were bringing about $32, and sheet bars $33 to $34. In April small lots of Bessemer billets were bringing $31 to $31.50 and basic billets were up to $34. In May there was not much steel being sold, buyers being pretty well covered, but steel was very scarce. A good deal of foreign steel was being offered at this time at about $32, Pittsburgh. At the close of May Bessemer billets were held at $33 for small lots. Consumers were unable to get deliveries promptly from domestic mills and a large tonnage of steel was being imported. In the first week in June a sale of 2500 tons of foreign sheet bars was made at about $32.50, Pittsburgh. In June the market was quieter and domestic Bessemer billets were held at about $32.50. In July a good many of the sheet, tin plate, wire and wire nail mills were closed and the consumption of steel had fallen off a good deal. At this time some new open hearth capacity came into the market and some parties who had bought foreign steel were offering it on the market for resale. July closed with domestic Bessemer billets held at about $32, and foreign billets being offered at $31, or less. In August Bessemer billets for prompt shipment were held at about $33 and for extended delivery at $31. A good deal of foreign steel was coming in at this time, and this was affecting prices of the domestic material. At the close of August the demand for steel was quiet and domestic billets were offered at $50.50 to $31. A good many finishing mills were still idle and consumption of steel had fallen off considerably. At the close of September the market on steel was firm, foreign billets being offered at $29 and domestic at $30 to $31. In the latter part of September a leading interest bought 10,000 tons of foreign billets at a price equal to about $29, Youngstown. There was not much change in the steel market for the balance of the year, prices of Bessemer ranging from $28 to $29.50, and open hearth from $30 to $31. It is evident that had it not been for the large imports of foreign steel during the year prices of domestic would have been very much higher. In October an attempt was made to advance the duty on foreign billets from $6.72 to $8.96 a ton, but the matter was finally arranged on the old basis. At the close of November Bessemer billets were held at $28.50 to $29, and foreign at about the same price. The year closed with Bessemer billets ranging from $28.50 to $29.50 and open hearth $30 to $31, at mill.

Steel Rails.—The price of steel rails remained at $28, at mill, for standard sections all through the year. While figures for 1902 are not yet available, it is evident that the output of rails this year has been fully equal to 1901, when the total production of all kinds of rails was 2,874,639 tons. The rail mills have had steady work all through the year and will carry over into 1903 possibly 400,000 tons of rails which they will not be able to deliver this year. Some excellent records for production have been made at the Edgar Thomson works of the Carnegie Steel Company and at the Ohio works of the National Steel Company. The latter mill was put on rails in the summer, and it was thought would be good for about 35,000 tons a month. In October the Ohio works made about 52,000 tons, and it is possible that the plant may be brought up to 60,000 tons a month. It is evident that a large tonnage of rails will be imported in 1903, as already a good many orders with foreign mills have been placed. The new rail mill of the Tennessee Coal & Iron

Company has been started and is making rails of open hearth steel. It seemed probable at one time that a rail mill would be built by the Union Steel Company in 1903, but the absorption of this concern by the United States Steel Corporation doubtless means that this will be abandoned.

Finished Material.

Structural Material.—The year 1902 in the matter of tonnage has been the biggest year the structural trade has ever seen, and all indications are that 1903 will be fully as large and may surpass it. The demand for structural steel in 1902 was enormous, and at different periods it was almost impossible to obtain deliveries at any price. This is shown from the fact that while the association price of beams and channels up to 15 inches was steadily maintained at 1.60 cents all through the year, yet thousands of tons sold at prices ranging all the way from 2 cents and up to 3 cents a pound. Indeed, it is claimed that where a builder wanted a few beams for a small building he paid as high as 4 to 5 cents a pound in preference to waiting on the mills for deliveries. Nearly all the structural mills materially increased their capacity during the year by making additions to equipment. Some very large jobs were placed in the Pittsburgh district during 1902, among these being the Farmers' Bank Building, about 10,000 tons, the Fort Wayne Railroad bridge and other structures. A good many large local jobs are on the carpet for 1903, and the consumption of structural steel in the Pittsburgh district next year will be very heavy. On December 18 the beam pool was renewed for another year and the large interests will probably insist that no advance in prices be made in order to encourage consumption. The wisdom of this policy was thoroughly demonstrated in 1902, when the mills had more business than they could handle. At the close of 1902 the leading structural mills were practically sold up for the first six months of 1903, and unless some unforeseen events should occur all the mills will have steady work through 1903 and at profitable prices. There were some importations of structural steel during 1902, and it is probable that a good deal of tonnage in shapes will be imported in 1903, as demand promises to be larger than the mills can fill.

Plates.—In the first three or four months of 1902 the demand for plates was only moderate, but in the last half of the year the mills were literally swamped with tonnage, and concerns that could make reasonably prompt delivery were able to get from $4 to $8 a ton over regular prices. The price of plates was unchanged during 1902, remaining on the basis of 1.60 cents for tank ¼-inch and thicker, f.o.b. Pittsburgh. There were times, however, during the year when as high as 2.25 cents was paid for prompt delivery. The Jones & Laughlin Steel Company, Carnegie Steel Company and Cambria Steel Company made material improvements and additions to equipment during the year by which their output of plates was considerably increased. The Cambria Steel Company added a new universal mill of very heavy dimensions and which is making a good record for output. Demand for plates from the car concerns was very heavy all the year, and in October a large new company appeared in the person of the Standard Steel Car Company, who built large new steel car works at Butler, which will take upward of 500 tons a day. It is said that the Pressed Steel Car Company consumed on an average of 1000 tons of plates and smaller shapes a day all through the year. Most of this tonnage is furnished by the Carnegie Steel Company on a sliding scale basis. It is certain that the plate mills will have all the tonnage they can handle in 1903, as certain of the leading interests are already practically sold up for the whole year. The Pittsburgh Steamship Company will build a large number of new ore boats during 1903, and which will require a heavy tonnage of plates. The plate agreement was renewed in December for 1903, and while some of the mills insisted that an advance in prices should be made, yet it is probable that present prices will be continued for some time at least and perhaps all through the year.

Iron and Steel Bars.—The trade in bars during 1902 was fairly satisfactory, the first half of the year being more satisfactory than the second half. At the opening of the year iron and steel bars were held at 1.50 cents, at mill, in carloads. The demand was good and the mills had all the work they could handle. On January 29 a meeting of the leading makers of steel bars, such as Carnegie Steel Company, Jones & Laughlin Steel Company, American Steel Hoop Company, Cambria Steel Company and Republic Iron & Steel Company, was held in this city, and reports showed that tonnage was heavy and that large consumers were placing contracts that insured full work for the mills for months ahead. Prices of steel bars remained at 1.50 cents for large lots through February, but in the early part of March the demand was so heavy and the mills were filled up so far ahead that some sellers were holding steel bars at 1.60 cents minimum. About March 15 it was decided by the mills to advance the price of steel bars to 1.60 cents, effective April 1, with the understanding that all contracts placed prior to that date would be at the old price of 1.50 cents. This resulted in leading implement makers and other large consumers of bars in placing contracts for fully 300,000 tons or more. On April 1 the price of steel bars was advanced to 1.60 cents and remained at that figure throughout the year. In the last two or three months of the year tonnage fell off somewhat and large new bar mills of the Carnegie Steel Company, at Duquesne, and the Jones & Laughlin Steel Company were turning out an enormous tonnage, which was being felt in the market. The price of iron bars was officially fixed at 1.80 cents in the early part of the year, but there were periods during the year when higher prices were obtained for prompt delivery. In the latter part of 1902 the demand for iron bars fell off somewhat and prices receded slightly, some mills taking contracts at 1.70 cents, Pittsburgh. The outlook for the bar trade for 1903 is satisfactory, as present prices in view of the steel market, are regarded as conservative.

Sheets.—In 1902 there was a very large increase in sheet capacity, caused by the building of a number of new mills. The demand for sheets in the early part of the year was sufficient to take the output of the mills, but in the summer months capacity seemed to overtake the demand, with the result that the American Sheet Steel Company, in October, announced a reduction of $5 a ton in prices of black and galvanized sheets, which was promptly met by the outside mills. The year opened with No. 28 black sheets selling at 3 cents, at mill, and galvanized at 75 and 10 off. These prices continued practically unchanged until October, when the reduction was made by the leading interest. The sheet trade in the last three months of the year was not satisfactory and a good many mills were idle for want of orders. The outlook for 1903 is somewhat dubious, but it is hoped an improvement in the demand will soon take place. It is evident that small sheet mills that have to buy sheet bars in the open market cannot put them into sheets at present prices and realize a very large profit. During 1902 thousands of tons of foreign sheet bars were imported into this country, the sheet mills being unable to get deliveries from domestic mills.

Skelp.—The first six months of 1902 in the skelp trade were much better, both in demand and prices, than the last six. The year opened with grooved iron skelp selling at about 1.75 cents and grooved steel about 1.80 cents. The market was practically without change until March, when the demand became very active and prices advanced rapidly. In April it was almost impossible to get deliveries of skelp and very high prices were paid. In the early part of May grooved iron skelp was selling at 2.10 cents and steel at about 2.25 cents. This was about high tide, these prices being maintained until July, when the market eased off. In the last three months of the year the demand for skelp was very quiet, with both grooved iron and steel ruling at about 1.90 cents.

Tubular Goods.—As was the case in other lines of finished iron and steel, the market on tubular goods was more satisfactory in the first six months of 1902 than in the last half. During the first six months, especially in April and May, the tonnage in pipe was very heavy and the mills had all the work they could possibly turn out. Later in the year, however, a good deal of new capacity came on the market; the new and modern pipe mills of the Youngstown Iron Sheet & Tube Company, at Youngstown, Ohio; the La Belle Iron Works, at Steubenville, Ohio; the Wheeling Steel & Iron Company, at Wheeling, W. Va., and other smaller concerns got into active oper-

ation. At this time the demand fell off somewhat and prices were being materially shaded. This resulted in the National Tube Company issuing a lower list of discounts on November 12, which on certain kinds of merchant pipe showed a very material reduction in prices. These lower prices were promptly met by the outside mills, and, in fact, were shaded slightly. The tonnage in pipe in 1902 was much heavier than in 1901, the business of the leading interest showing an increase of nearly 50 per cent. The outlook for 1903 is regarded as very satisfactory and it is believed there will be plenty of work for well equipped pipe plants that have their own skelp mills. Small pipe plants that depend on the open market for skelp may have more or less trouble in meeting prices made by the larger mills. The new skelp and pipe mills of the Sharon Steel Company at Sharon, now owned by the United States Steel Corporation, will be started early in 1903. These are very modern mills.

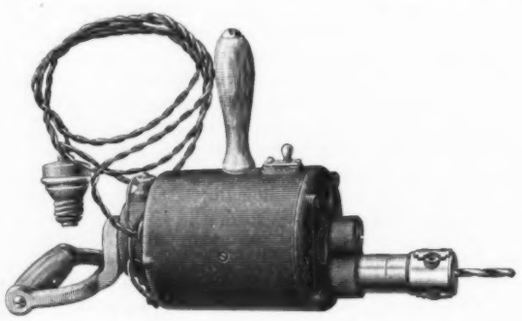
Connellsville Coke.—The coke trade in 1902 made an unprecedented record in every way, the output having been much larger and prices reaching a higher level than ever before in the history of the trade. It is probable that the output of coke for 1902 will reach 12,500,000 tons, an increase of about 1,500,000 tons over 1901. This increase would have been very much larger had it not been for the serious shortage in cars and motive power which prevailed during the last six months of the year and which promises to continue through the first three months of 1903, at least. It became necessary at different times to close down coke works, as heavy stocks were piled up, using all the available room, and cars and motive power could not be had to move the output of the ovens. The price for furnace coke fixed by the H. C. Frick Company at the opening of 1902 was $2.25 a ton for delivery all through the year. However, in the summer the anthracite coal strike occurred, shutting off the supply of this fuel from Eastern blast furnaces and creating an increased demand for coke, and this together with the car and motive power shortage made it almost impossible to get coke at any price. As high as $10 to $12 a ton was paid for emergency coke, and thousands of tons were sold on good sized contracts at $5 to $6 a ton. The coke operators made enormous profits and the year 1902 has probably broken all records in this respect.

In the latter part of December came the announcement from the Frick Coke Company of a voluntary advance in wages of about 8 per cent., affecting about 18,000 men employed by this concern. The Bessemer Coke Company and other leading coke interests also gave their men the same advance, and wages for coke labor are now much higher than ever before. The year was entirely free from labor disturbances of any kind, due to the commendable policy of the H. C. Frick Coke Company and the other coke interests in paying the very highest rate of wages that the selling price of coke will permit. An item of great interest during the year was the retirement from the market of the Frick Coke Company as sellers of foundry coke and the restricting of the selling of their furnace coke to about a dozen blast furnaces in the Mahoning and Shenango Valleys, from which constituent interests of the United States Steel Corporation will get pig iron. It is likely that within a year or so the Frick Coke Company will retire entirely from the market as sellers of coke, their entire output going to identified interests. The outlook for the coke trade in 1903 is excellent, and, barring unforeseen developments, the output will be much larger than 1902 and prices will also be high. There promises to be active building of new coke ovens in 1903, and a very large acreage of coal lands in the Connellsville region has recently changed hands at very high figures. Early in 1903 the Frick Coke Company will start up a number of new ovens in the Pocahontas region which have been under construction for some time.

The Chicago Pneumatic Tool Company have issued invitations to all of their representatives, both of this country and Europe, to attend a meeting which will be held at the general offices of the company, 1010 Fisher Building, Chicago, on January 5, 1903. It is proposed at this meeting to have the reports of the representatives dealing with the trade conditions in the various parts of the civilized world gone over very carefully, and a more thorough understanding of the requirements of both the foreign and domestic customers of the company will undoubtedly be secured. The unprecedented amount of business transacted during the past year has made this step desirable, and as the large returns from the Continent show conclusively that the introduction of pneumatic tools across the water is a decided success, it is proposed to transact foreign business by American methods and is therefore necessary to have all the representatives of the company keep in close touch with each other. It is hoped that this general meeting will result very beneficially to all concerned, and it will in all probability be repeated each year as it enables the company to fulfill their customers' requirements more satisfactorily, and it has been toward this end that they have directed all their energies since the beginning of their career.

The Hisey Electrically Driven Hand or Breast Drill.

A simple portable electrically driven hand or breast drill has been designed recently by the Hisey-Wolff Machine Company of Cincinnati. It consists of an inclosed motor suitably geared for driving the drill spindle.



THE HISEY ELECTRICALLY DRIVEN HAND OR BREAST DRILL.

The case is provided with two handles, as shown in the engraving, by means of which the tool can be held in any desired position. It can be used in any place where connection can be made with an incandescent lamp socket. It is under perfect control at all times through a switch placed near the vertical handle. They are made in three sizes to hold drills from 0 to ¼inch, 0 to ⅜ inch and 0 to ½ inch in diameter, at weights of 14, 16 and 24 pounds respectively.

Proposition to Reduce Waste of Power.

The American Roller Bearing Company, Boston, Mass., have made a novel proposition to mill owners for reducing the power wasted in their plants. In order that the mill owner may be sure of what his investment really means to him in cash, they offer a contract agreeing to save a given percentage of the power consumed in the line shafting of a plant on penalty of forfeiting on their contract price if the percentage of saving falls below their contract figure. They also guarantee the durability of their bearings for a given period or offer to maintain them an indefinite period of time for a yearly compensation. They have already secured many contracts on these lines and are rapidly proving that their bearings are remarkable for the saving of power and durability.

Some of the largest manufacturers of traveling cranes are also taking up the bearing and finding that the saving of power is such that great changes can be made in the motive power required to operate the cranes. These fields are ideal for antifriction bearings, for at present the bearing friction is an important factor in their operation.

The Philadelphia Iron Trade.

BY THOMAS HOBSON, PHILADELPHIA.

In writing a review of the iron trade for the year 1900 we said it had been one of the most extraordinary periods on record. Last year we had to say practically the same thing, and this year we must say it again, but with greatly increased emphasis. Those who have spent most of their lives in the trade, and who have watched its ups and downs, may be supposed to know something about it, but they admit that they were never more perplexed than they are at the present time. Almost every theory that has been propounded and which found general acceptance at various periods during the past three years has been knocked to pieces and at the present time the perplexity is greater than ever. Three years ago it was firmly believed that the world's markets were ours, to-day it looks more like our market being a market for the world. It was also an accepted theory that $20 pig iron was a thing of the past, but millions of tons have been sold at much higher figures than that, and even with imports at the rate of a million tons or more per annum it seems impossible to get iron down to a $20 basis. This is discouraging to prophets, but all the same people will go on thinking, which is tantamount to guessing, as without that business could hardly exist. Naturally, however, the inquiry is, How is it that forecasts have been so far astray?

To answer this opens a wide field for discussion, but a few salient features may be briefly considered. Pig iron was at the low point of about $11 per ton in 1898, steel billets at about $17 and plates at very little over a cent a pound. These low prices attracted business from abroad and during 1899 we exported very heavily in all lines. This gave business a big start, and in 1899 an advance in prices was established equal to about 75 per cent. This was a little too rapid, and in 1901 there was a set back in prices from the high figures of 1900 averaging from 12½ to 25 per cent. The decline was measurably due to the failure of the corn crop of that year, as it was firmly believed that the loss of nearly 1,000,000,000 bushels of corn would check further expansion in business, and especially in the iron and steel trades.

The strength of the position appears to have been underrated, however, and while prices had quite a serious decline, temporarily, the demand continued, and it was not far on in 1902 before prices began to stiffen; and in course of six months had reached the highest figures of the previous year, with the largest sales ever known and at very close to the highest figures within a period of 20 years. It may indeed be said that the largest tonnage in any year and at the highest prices of any year (for so large a tonnage) may be credited to 1902. The strength of the position to-day is mainly due to the magnificent crops recently garnered, to the large earnings of the railroads, and to the necessity for continued expenditures to meet the increasing requirements of the country.

This is one phase of the situation, but there is another which is less encouraging. There is some reason to fear that we may be overtrading, and while a great many people dislike what are called "pessimistic views," yet it would be unfair to give one side without giving the other equal consideration. There are a lot of things that appear to be charged with elements of danger. High priced fuel and insufficient fuel, high costs everywhere, with prices of raw material greatly out of proportion with finished products. Then we have imports amounting to 1,000,000 tons a year, and which may be considerably more than that in 1903, unless changes are made which at the moment appear to be very improbable. At the present cost of production pig iron cannot be much lower; yet if prices are maintained our markets will be even more attractive for foreign material than they have been during 1902.

Conditions in Europe are distinctly bad, prices of pig iron in some of the markets having dropped about $1.50 per ton from the highest, but from the low starting point there is a further margin for a decline of possibly $1.50 more. From this it would appear that if our prices are maintained shipments of foreign iron will increase, while if they decline foreign iron will be very likely to go with it to the extent named, requiring a pretty heavy drop to equalize matters. From this standpoint, therefore, it looks as though lower prices would have to be made to protect the home trade, but on the other hand, where is American iron to come from at low prices?

Furnaces are bare of stock, consumers' yards are almost empty, while unfilled orders are extremely heavy. Under such conditions what furnace is going to make a cut in prices, for which at the moment there is no special necessity? They may have to do so eventually, but if large buyers were in the market to-day they would consider themselves very much favored even if fractionally lower prices were quoted to them. Under present circumstances, therefore, while the necessity for lower prices is apparent, it is hardly to be expected that any furnace company will volunteer to lead the way. Such conditions, however, are not conducive to a settled market. It is an uncomfortable thing to feel that the foundation is weak and that in any event it is merely a question of time when it will slide out of place. There is no probability of any such event in the near future, but no one who knows the business expects prices to be maintained for any great length of time at their present level. Conditions are entirely abnormal, and while, as already stated, there is no immediate prospect of changing them, yet it would be contrary to all former experience for an advance of 100 per cent. to be maintained when the natural trend of events in all lines is toward lower costs. Probably the chief difficulty as regards the spring and summer trade is the uncertainty in regard to prices, which at the present time average $7 per ton higher than was quoted at equal date a year ago. This is the more significant when it is remembered that at that time no foreign iron was being imported, although our last annual review says: "A little more decline in Europe, and a little better prices here, would soon open the way to imports." But there was no expectation of any such volume as we have had and are likely to have in the near future. Not only has English and Scotch iron invaded our markets, but even Canada, France, Russia and Germany have made shipments, and so long as American iron costs over $20 per ton it will not be easy to keep them out. It is also remarkable what a variety of grades we have had. Low grade pipe iron, high grade foundry, hematites, low phorphorus, almost anything in fact that buyers specified have been shipped, not only to leading ports, such as Philadelphia, Baltimore, New York and Boston, but also via New Orleans and Canadian ports to the Central West and the Northwestern markets. It is very remarkable that an invasion of such proportions was made without disturbing the markets; yet under the circumstances it has ben a help rather than a hindrance, as without supplies from outside there is little doubt that during the summer and fall months work in many lines would have been seriously curtailed. Still with such vast resources as we have in our own country it ought to be possible to make enough pig iron without importing.

Pig Iron.

Prices began in January at about $16.50 for No. 2 X Foundry; and at no time went below that figure.

There was an advance to $17 by the end of the month; to $18.75 by the end of February; to $19.50 in March; to $20.50 in April; to $21 in May; continuing at about that figure during May, and again advancing until $23 was reached in June—a total gain during the half year of $6.50 per ton, besides premiums for prompt shipments, which were maintained all through the summer and fall months. Beginning in April foreign iron began to make its appearance, and by July shipments were so large that prices of American iron were distinctly affected, and during that month there was a reaction of about $1 per ton. Prices continued unchanged during August and September. During October the effects of fuel shortage and car shortage began to be severely felt, and although more or less inconvenience had been felt all summer, it had been regarded as a temporary derangement, and no serious attention was given to the matter until prices of coke began to be twice and three times, and in some cases four times what had been figured on. This shattered all hopes of lower prices for a considerable time to come, and although prices lost a trifle during December there is nothing to indicate any decline beyond what is usual during holiday seasons. As already mentioned, foreign iron will have to be reckoned with, but apart from that there is nothing in the immediate outlook that indicates any material change from the prices now ruling—say about $23 for No. 2 X Foundry.

The exports of pig iron from Great Britain to the United States during the year to November 30 were 415,000 tons, and allowing for the remaining month, it is safe to assume that at least 450,000 tons of pig iron will come in from Great Britain. The exact figures for the exports from Canada and Germany are not available at the moment, but 150,000 tons would not be an excessive estimate, so that 600,000 tons of foreign pig has probably been used during the year, as substitutes for American iron.

In the last issue of *The Iron Age* (page 10) some very interesting correspondence may be found from large consumers who have used foreign irons.

The average selling prices for No. 2 X Foundry during the year was about $20.50, and for basic iron $19.25.

Prices on the first of each month were as follows:

	$	$
JANUARY 1.		
No. 2 X Foundry	16.50	to 17.00
No. 2 Plain	16.00	to 16.50
Basic	15.75	to 16.00
FEBRUARY 1.		
No. 2 X Foundry	16.75	to 17.50
No. 2 Plain	16.00	to 16.50
Basic	16.50	to 17.00
MARCH 1.		
No. 2 X Foundry	18.50	to 19.00
No. 2 Plain	17.75	to 18.25
Basic	18.00	to 18.50
APRIL 1.		
No. 2 X Foundry	19.25	to 20.00
No. 2 Plain	18.75	to 19.00
Basic	19.00	to 19.50
MAY 1.		
No. 2 X Foundry	19.75	to 20.50
No. 2 Plain	19.25	to 19.75
Basic	19.00	to 19.50
JUNE 1.		
Premiums $1 to $2 per ton for prompt deliveries. (Mainly on foreign grades.)		
No. 2 X Foundry	19.75	to 20.50
No. 2 Plain	19.50	to 20.00
Basic	19.00	to 19.50
JULY 1.		
Premiums, $1 to $1.50.		
No. 2 X Foundry	22.75	to 23.50
No. 2 Plain	22.25	to 22.50
Basic	21.00	to 22.00
AUGUST 1.		
Premiums continued.		
No. 2 X Foundry	22.00	to 22.50
No. 2 Plain	21.00	to 22.00
Basic	20.50	to 21.00
SEPTEMBER 1.		
Premiums continued.		
No. 2 X Foundry	22.00	to 22.50
No. 2 Plain	21.00	to 22.00
Basic	20.50	to 21.00
OCTOBER 1.		
Premiums continued.		
No. 2 X Foundry	22.00	to 22.50
No. 2 Plain	21.00	to 22.00
Basic	20.50	to 21.00
NOVEMBER 1.		
Premiums reduced.		
No. 2 X Foundry	23.50	to 24.50
No. 2 Plain	22.25	to 22.75
Basic	21.00	to 21.50
DECEMBER 1.		
Premiums not required.		
No. 2 X Foundry	23.00	to 24.00
No. 2 Plain	22.50	to 23.00
Basic	20.50	to 21.00

Steel Billets.

Prices of billets have not varied much during the past year and sales of American have been less important than in previous years, 1, because the makers were also consumers and had comparatively little to offer to the outside trade, and 2, because many consumers now make steel for their own use. Foreign steel, however, has become an important factor, imports during the first ten months of the year having been 222,011 tons (this, however, includes angles, beams and steel bars), against 6603 tons for the corresponding period of the previous year. Imports are expected to amount to about 50,000 tons during the two last months, so that the total imports will reach pretty close to 270,000 tons.

Prices of ordinary steel began in January at $30 per ton, stiffened a little during the month, and in February had advanced to $32.50; in March to $33, in April to $34, but during the entire period it was almost impossible to get deliveries. In May foreign steel began to come in, and as prices ranged from $30 to $32.50, ex-ship, interest in American steel was pretty well lost. This continued during June and July, with some easing off in foreign steel, purchases during the latter month having been made at less than $29. During August and September there was further decline in foreign steel, sales having been made at $27.50, and in some cases orders were placed at less than $27. Then came the ruling for a higher rate of duty, and while it checked business for a while, there was a resumption of imports at $27.50 when the claim for a higher tariff was abandoned, and at the figure named there has been practically no change during the past two months.

Plates.

In no department has there been such uniform activity as in the plate trade. The year began with plenty of orders, and there has been no time since then in which business could not be had for the asking, and without going below quoted rates. Ordinary ¼-inch plates began at 1.75 cents and kept at that figure as a minimum during the first three months. During the four months the press of business was so heavy that an advance to 1.85 cents was established, while during May 1.95 cents began to be an inside price, reaching 2 cents as a minimum during the sixth month, a gain of $5 per ton from the opening figures. During the remainder of the year (July to present date) 2 cents has been the ruling figure for carload lots as a minimum; sometimes 5 or 10 cents per 100 more was paid for quick shipments, but practically there was no quotable change during the entire half year.

This is an excellent record, but compared with the prices for raw material the advance is considerably out of proportion. The advance in pig iron alone was $5 per ton, while coal was nearly double what was figured on; but, worse yet, supplies were so irregular that during the last half of the year it was impossible to work economically. Occasionally a week at a time was lost for want of fuel, at others a day or two, but during the last quarter it was a continual struggle to secure more than two or three days' supplies at a time. Add to this a continued shortage in pig iron and the inadequacy of rolling stock for transportation, it will be seen that conditions were far from what would otherwise have been regarded as extremely favorable.

The increase in the capacity for production is vastly larger than it was a year ago, yet the output has been below requirements during the entire period. It should be said, however, that there has been no opportunity for making a full production, although if there had been it would probably have made no great difference, as what cut down production cut down consumption also.

The plate trade is usually a pretty good indicator of general conditions. When boiler makers are busy it shows that steam users, and that includes all lines of trade, are prosperous. The year now closing will no doubt surpass all former years as regards boiler work, locomotive work, tank building and bridge building. Shipbuilding has not been conspicuously active, although it will no doubt average fairly with the best of former years, but it is not the backbone of the plate trade to the extent that it was in the recent past. Car building has taken a heavier plate tonnage than any other interest during 1902, and it will probably maintain that position indefinitely. Locomotive builders have also been large consumers and are expected to require still larger quantities during 1903. The Baldwin Works, for instance, turned out 1530 locomotives during 1902 and have practically arranged for 40 engines per

week during 1903, so that the outlook for the plate mills is certainly of a most hopeful character, particularly if normal conditions as regards supplies and transportation can be established at an early date.

Structural Material.

The year 1902 has certainly been the most remarkable period that the trade has ever experienced. Prices have nominally remained the same during the entire year. Some business was done at from 1.75 to 1.90 cents (covering all specifications) during January, but in the month following an advance of 1-10 to 3-10 cents was established, which continued during March, but during April was increased 2-10 to 3-10 cents more, actual selling prices being 2.25 to 2.35 cents. During May foreign material began to arrive, but made no difference in prices, as there was plenty of demand at the figures named so long as prompt deliveries could be guaranteed. During June and July the scarcity enabled sellers to get prices varying from 2.50 to 2.75 cents, while 3 cents was sometimes paid for prompt shipments of specifications sent to the mills. During August and September foreign material began to make itself felt, and orders at 2.25 to 2.40 cents were easily placed. October showed a decided weakening, which has continued to this date, little by little, until at the present time prices are just about as they started a year ago—viz., 1.75 to 1.90 cents. Prospects for the coming year are a little indefinite, although whatever the demand may be it is reasonably certain that the productive capacity will be largely increased.

Bars.

In many respects the bar trade has been the best in a good many years. This is believed to be the result of measures that were taken to secure uniform prices by the united action of the Eastern and Western Bar Iron associations. Prices have been none too high, however, the price of steel bars having been a permanent barrier to anything like high prices, but there was a steady demand, and during a good portion of the year the results were very satisfactory. January commenced with prices at 1.72 cents, which were continued until the end of February. During March an advance to 1.82 cents was established, and another in April to 1.92 cents, which was continued unbroken to October. During the summer months premiums of from $1 to $3 per ton were paid for prompt shipments, but the official price remained unchanged at 1.92 cents. These prices were for carload lots as a minimum quantity at Philadelphia or equivalent points. Steel bars were at all times quoted at less money than for refined iron, but to get deliveries in reasonable time it was frequently necessary to pay $2 to $3 per ton more, especially for large sizes.

Sheets.

There has been a very large business in sheets, but there was not so much difficulty in getting deliveries as there was during the year previous. Prices have been on a lower basis than they should have been, considering the cost of raw material, but they appear to have reached rock bottom. The mills in this district run largely on specialties, on which they have a National reputation, so that quotations are not of as much general interest as in some other lines. With the McCullough Iron Company, dating back to more than 100 years, and the Wood companies at Conshohocken respectively 76 and 90 years, it is easy to understand that certain lines are pretty well in their hands, without the necessity of conforming precisely to quotations made for products of a more general character.

Old Material.

The market for old material has been very erratic at times and changes in prices difficult to explain satisfactorily. Sometimes the demand ran in special lines resulting in sharp advances, and just as sudden declines, when the demand dropped off. Prices have been considered abnormally high and the risks of handling too great to allow a fair margin to dealers. The opening prices in January were from $2 to $5 per ton less than they are at the present time, which in most articles are pretty well toward the highest of the entire year.

JANUARY.

Low Phosphorus Scrap	$22.00 to $22.50
Heavy Melting Steel	18.25 to 18.50
No. 1 Railroad Scrap	20.00 to 21.00
No. 1 Yard Scrap	16.00 to 17.00
Machinery Cast	14.00 to 14.50
Wrought Turnings	13.00 to 13.50
Cast Borings	8.00 to 8.25
Car Wheels (old)	17.00 to 17.25
Steel Axles	19.00 to 20.00
Iron Axles	24.00 to 25.00

FEBRUARY.

Low Phosphorus Scrap	$22.00 to $24.00
Heavy Melting Steel	19.25 to 19.50
No. 1 Railroad Scrap	21.00 to 21.50
No. 1 Yard Scrap	19.50 to 20.00
Machinery Cast	14.75 to 15.25
Cast Borings	8.00 to 8.50
Car Wheels (old)	17.00 to 17.50
Steel Axles	.... to ....
Iron Axles	24.50 to 25.50

MARCH.

Low Phosphorus Scrap	$24.00 to $25.00
Heavy Melting Steel	19.25 to 20.00
Choice Railroad Scrap	24.00 to 25.00
No. 1 Yard Scrap	.... to ....
Machinery Cast	15.50 to 16.00
Wrought Turnings	13.75 to 14.00
Cast Borings	8.00 to 8.50
Car Wheels (old)	17.50 to 18.00
Steel Axles	.... to ....
Iron Axles	25.00 to 25.50

APRIL.

Low Phosphorus Scrap	$25.00 to $26.00
Heavy Melting Steel	21.00 to 22.00
Choice Railroad Scrap	24.00 to 25.00
Machinery Cast	16.50 to 17.50
Wrought Turnings	15.50 to 16.50
Cast Borings	9.75 to 10.25
Car Wheels (old)	17.50 to 18.00
Iron Axles	26.00 to 27.00
Steel Axles	22.00 to 23.00

MAY.

Low Phosphorus Scrap	$25.00 to $26.00
Heavy Melting Steel	21.00 to 22.50
Choice Railroad Scrap	24.00 to 25.00
No. 1 Yard Scrap	20.00 to 21.00
Machinery Cast	17.75 to 18.50
Wrought Turnings	17.00 to 18.00
Cast Borings	10.00 to 10.50
Old Car Wheels	19.50 to 20.50
Iron Axles	27.00 to 28.00
Steel Axles	25.00 to 26.00

JUNE.

Low Phosphorus Scrap	$25.00 to $26.00
Heavy Melting Steel	21.00 to 21.50
Choice Railroad Scrap	23.00 to 24.00
No. 1 Yard Scrap	19.00 to 20.00
Machinery Cast	18.00 to 18.50
Wrought Turnings	16.00 to 17.00
Cast Borings	10.00 to 10.50
Steel Axles	27.00 to 28.00
Iron Axles	29.00 to 30.00

JULY.

Low Phosphorus Scrap	$27.50 to $28.25
Heavy Melting Steel	21.00 to 21.50
Choice Railroad Scrap	23.00 to 24.50
Country Scrap	18.75 to 19.75
Machinery Cast	17.75 to 18.75
Wrought Turnings	18.50 to 19.00
Cast Borings	10.50 to 11.00
Old Car Wheels	20.00 to 21.00
Steel Axles	27.50 to 28.50
Iron Axles	29.00 to 30.00

AUGUST.

Low Phosphorus Scrap	$27.50 to $29.00
Heavy Melting Steel	20.50 to 21.50
Choice Railroad Scrap	23.00 to 24.00
Country Scrap	18.50 to 19.50
Machinery Cast	17.75 to 18.75
Wrought Turnings	18.50 to 19.00
Cast Borings	10.50 to 11.00
Old Car Wheels	20.00 to 21.00
Steel Axles	27.00 to 28.00
Iron Axles	29.00 to 30.00

SEPTEMBER.

Low Phosphorus Scrap	$27.50 to $29.00
Heavy Melting Steel	20.50 to 21.00
Choice Railroad Scrap	23.00 to 24.00
Country Scrap	19.00 to 20.00
Machinery Cast	19.00 to 20.00
Wrought Turnings	18.00 to 18.50
Cast Borings	10.00 to 10.50
Old Car Wheels	20.00 to 21.00
Steel Axles	26.00 to 27.00
Iron Axles	29.00 to 30.00

OCTOBER.

Low Phosphorus Scrap	$26.50 to $28.00
Heavy Melting Steel	20.50 to 21.00
Choice Railroad Scrap	23.00 to 24.00
Country Scrap	20.00 to 21.00
Machinery Cast	19.50 to 20.00
Cast Borings	10.50 to 11.00
Car Wheels (old)	21.00 to 21.50
Steel Axles	25.50 to 26.50
Iron Axles	30.00 to 31.00

NOVEMBER.

Low Phosphorus Scrap	$26.50 to $27.50
Heavy Melting Steel	20.50 to 21.00
Choice Railroad Scrap	23.00 to 24.00
Country Scrap	20.00 to 21.00
Machinery Cast	19.50 to 20.00
Wrought Turnings	16.00 to 16.50
Cast Borings	10.50 to 11.00
Car Wheels (old)	21.00 to 21.50
Steel Axles	25.50 to 26.50
Iron Axles	30.00 to 31.00

DECEMBER.

Low Phosphorus Scrap	$26.50 to $27.50
Heavy Melting Steel	20.50 to 21.00
Choice Railroad Scrap	22.00 to 23.00
Country Scrap	20.00 to 21.00
Machinery Cast	19.50 to 20.00
Wrought Turnings	17.00 to 17.50
Cast Borings	10.00 to 10.50
Old Car Wheels	20.00 to 21.00
Steel Axles	25.00 to 26.00
Iron Axles	29.00 to 30.00

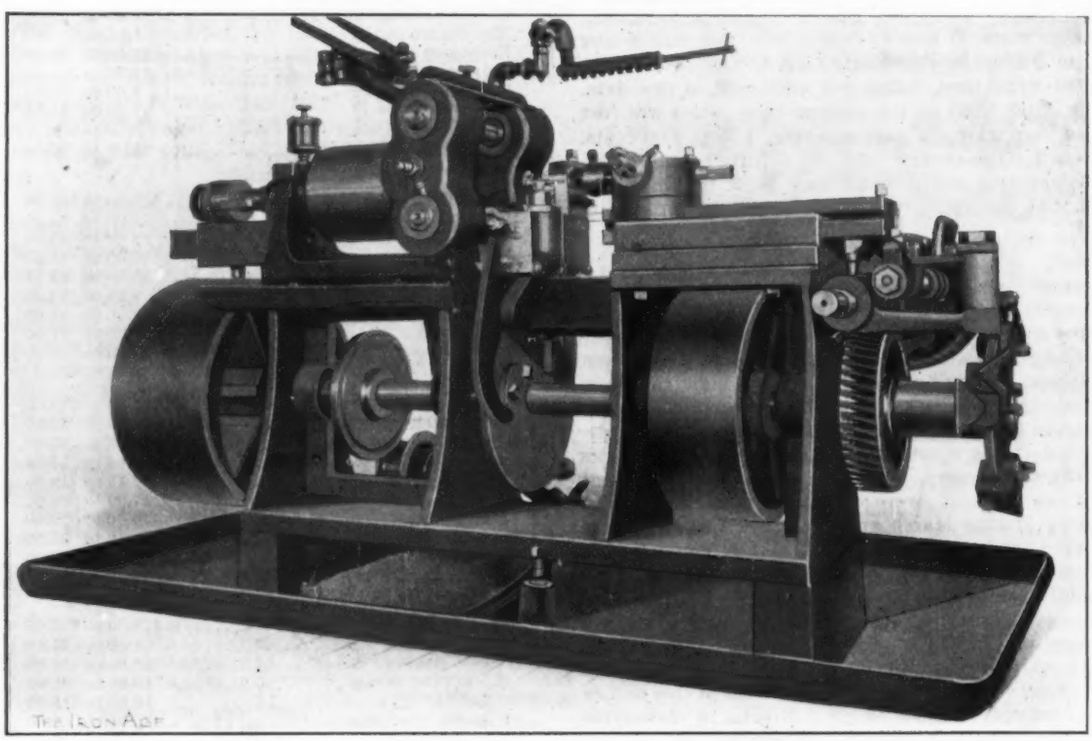
Fire Hazard of Electrical Apparatus.

A disastrous fire broke out in the power house of the Helena Light & Traction Company, at Helena, Mont., on the evening of October 20, completely demolishing the building. The high tension switchboard, lightning arrester equipment and, in fact, everything but portions of the six 11,000-volt 150-kw. Westinghouse transformers were totally destroyed. However, two of the transformers were not upset and, being oil insulated, their vital parts were protected from the fire. The four other transformers were standing on a wooden floor, and as soon as the latter was burned away they were upset and poured their oil into an engine pit below. There were also in the station two 100 hore-power induction motors, driving through a line of shafting six direct current arc light dynamos. The arc machines are totally destroyed, but from the report of the appraisers it appears that the induction motors were damaged only to the extent of 50 per cent. of their value. Although the marble distribution switchboard of the station was completely destroyed, there were found behind it three oil insulated Westinghouse potential regulators in cast iron cases which were practically uninjured, the damage appraised being $20 to provide handles, cable terminals and cleaning up. The results of this fire have demonstrated that oil insulated transformers are far more immune from injury than almost any other kind of electrical apparatus.

Special Attachment for Small Automatic Screw Machine.

BY C. L. G.

The photograph reproduced herewith illustrates one of the Pratt & Whitney small automatic screw machines, fitted with special attachments for turning out



SPECIAL ATTACHMENT FOR AUTOMATIC SCREW MACHINE.

small brass worm spindles similar to Fig. 2. The thread on these spindles, it will be noted, does not run entirely across the head of the spindle, and for this reason and also being of the "Hinley" type, could not be cut by a threading die. The method by which the thread is cut is just the reverse of that generally employed in hobbing out worm gears; in other words, a cutter of same cross section as the gear, which works in connection with the worm in question, is used to form the thread.

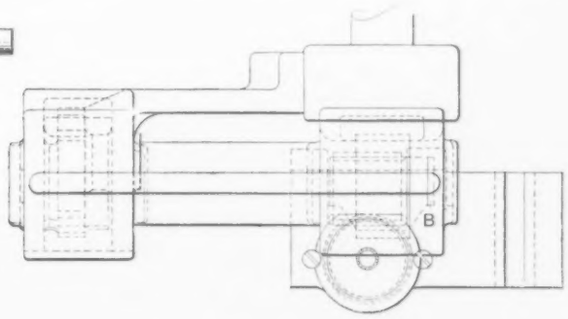
Referring to the line drawing, Fig. 3, the cutter referred to is indicated by A. It is held in a hollow spindle, which is rotated positively through gearing from the head spindle; the relative speeds of the head to the cutter spindle being 12: 1. (The worm being produced is single and drives a worm gear with 12 teeth.) The cutter spindle is mounted in the cross slide, consequently, by advancing the rotating cutter to the rod being machined, same as an ordinary cross slide forming cutter, a thread is formed. The cutter is ground on top and is adjusted to the same hight as the center of the rod. The teeth on the cutter are milled on an angle corresponding to the angle on a worm gear, which would run properly with the work produced.

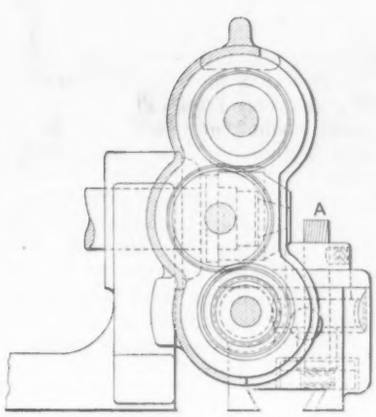
The cycle of operations required to finish these pieces is as follows: The rod is fed forward to a stop in the

turret; next, the thread is formed by the cross slide cutter (the work being supported during this cut by a stem rest in the turret); the two shoulders are then cut by suitable hollow mills. The small teat on the short end is formed by means of an undercut forming tool held in the rear of the cross slide, after which the cutting off tool severs the finished work from the rod. These pieces were turned out in 25 seconds each, and the reader will consequently appreciate the rapidity at which the different operations were performed.

The construction of the thread forming device is clearly shown in Fig. 3, but a brief description may not be amiss. To the head or work spindle is secured the spiral gear B, which drives its mate, C, which latter is secured to the shaft D. On the opposite end of the shaft is secured the spur gear E, and thus through the train of gears, E, F, G, the worm spindle F is driven. To this latter spindle a worm, which drives the cutter spindle through its mating gear, is splined, thus permitting the lateral movement of the cross slide.

Fig. 2.—The Worm to Be Cut.





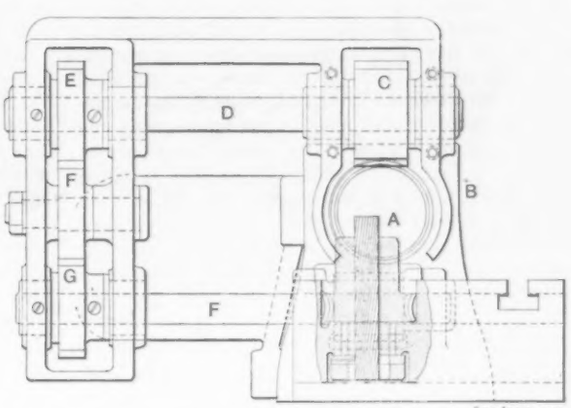


Fig. 3.—Details of Attachment.

SPECIAL ATTACHMENT FOR AUTOMATIC SCREW MACHINE.

Peat as a Substitute for Coal.

When it is remembered, says *Engineering*, that the British fleet of merchant steamers have machinery which collectively requires between 6000 and 7000 tons of fuel per hour to drive it, it will be readily understood that the increasing consumption of coal, with advancing prices, apart even from the possibilities of the exhaustion of the supply, awaken at times some measure of anxiety in the minds of marine engineers. Much interest, therefore, attaches to the paper read before the Institute of Marine Engineers by James Adamson. In 14 years there has been an increase of 42 per cent. in the tonnage mined in the United Kingdom, while exports have grown in the same period by 98 per cent., resulting in a steady increase in the average of prices apart from market fluctuations. Instead of entering into the economic question of conserving our supply by restrictive legislation, Mr. Adamson discussed the mechanical means for increasing the efficiency of each unit of fuel, counseling at the same time the development of other sources of power, notably waterfalls, refuse heaps at the mines, and garbage generally.

In this direction much valuable research is being carried out by the Institute in connection with peat charcoal and peat fuel, the use of which seems feasible with the high prices for coal now exacted and likely to be charged in the future. The analysis of the test samples by the Institute's experimental committee gave the following result: Carbon, 79.54 per cent.; ash, 3.51 per cent.; sulphur, 0.46 per cent.; volatile matters at red heat, 6.84 per cent.; moisture, 9.71 per cent.; total, 100 per cent. This test sample was simply prepared in the laboratory to find out what process would be necessary to prepare the peat for the market, the most suitable plant for treating it, and the probable cost. On further drying the test sample, the carbon was increased to 88.63 per cent., and the sulphur reduced to 0.44 per cent. For smelting and forging purposes a fuel with so small a percentage of sulphur is very desirable, and hopes were entertained that the peat thus treated would find a ready market. The extraction of the large percentage of moisture is one of the difficulties in preparing peat fuel for the market. The cost of production is the next necessary consideration. The estimated cost of peat charcoal is 80 shillings per ton, with 0.44 per cent. of sulphur, against a cost for coke in 1887 of 14 shillings per ton, with 0.9 per cent. of sulphur; cost of coal, 1887, 7 shillings per ton; 0.5 to 0.6 per cent. of sulphur; cost of coal, 1900, 17 shillings 6 pence, screened; 15 shillings 6 pence, unscreened; cost of coal, 1902, 10 shillings 6 pence, screened; 8 shillings 6 pence, unscreened, with a small percentage of sulphur, situable for forging purposes. These figures show that as time goes on and improved methods of dealing with peat are discovered, and the prices of coal increase, the relative prices of peat charcoal, coal, and coke may approximate to one another more closely. The analysis showing the by-products which may be obtained from the peat indicated that 1 ton of peat produced the following: 13,000 cubic feet of gas free from sulphur; 16 pounds acetic acid; 46 pounds wood naphtha; 20 pounds of sulphate

of ammonia; 12 pounds paraffin wax, and a quantity of tar. Some of the samples resulting from this process have been tested by the Institute, and yielded good results. Samples of crude peat from different parts of the kingdom have also been tested, and it is proposed to continue these tests and mixings with a view to discover what can be done to make use of peat in a manufactured state for domestic and other purposes.

The Lead Market in 1902.

BY E. A. CASWELL, NEW YORK.

It is too early to give any exact data on the lead product of the country for 1902, but it is roughly estimated as being not far from 300,000 tons, with the consumption close up to it, and probably 75,000 tons worked in bond.

Any review of the lead market for 1902 without the fullest consideration of the methods, system and workings of the American Smelting & Refining Company would be like the play of "Hamlet" with Hamlet left out. When that consolidation were organized in the spring of 1899 many verdicts were passed as to their bearing and influence on the lead trade. The concern have now been in existence and active operation for over three years and the effects of the new conditions have almost passed into history, or, to say the least, have so far settled down into a defined policy that the workings can be judged. The usual phases of the acquisition of power are, first, its reasonable use; second, its abuse, and third, its disappearance through revolt of the abused. Thus far the course pursued by the American Smelting & Refining Company has been wise, judicious, temperate and broad, but, nevertheless, there have been some mutterings and threats of revolution, which, however, thus far have not materialized into any serious results. This great centralization of power has extended its influence both on to the prior link in lead use—namely, the mining interest—and also on the subsequent one of the manufacturing interest. The miners have been in a position where they could take independent action a trifle more easily than the consumers, and while they have for the most part limited themselves to threats of building refineries, they have in a small degree actually sought and secured the treatment of their bullion outside of the large corporation. For the most part the miners have been asking a direct violation of the eternal law of supply and demand, and have been demanding of the refiner an absolute impossibility. Now any market left to itself becomes self regulating in that an excess of supply carries prices down and checks production, while the excess of demand carries prices up, stimulates production and brings about a reaction. The American Smelting & Refining Company have wisely sought to avoid these extremes and to so regulate the production that it would just reasonably meet the demand, and thus maintain the price of lead at its highest point, just short of importation cost. The miners could under no circumstances obtain more than that average, but many of them have insisted on the privilege of turning out an indefinite quantity of lead, and expecting the large concerns to carry it or export it at a loss, or in some inscrutable manner put it out of sight and existence. Failing to do this, refiners have been more or less threatened with dire disaster in the shape of new and independent refineries. That such action would promptly have resulted in very low and unremunerative prices seems evident, and it is equally palpable to any unprejudiced and unbiased observer familiar with the workings of the lead market that the American Smelting & Refining Company have thus far proved themselves a magnificent balance wheel in the lead trade. They have simply carried out what the common sense of the producers should have dictated. The schedule of prices has remained unchanged throughout the year in its relation of price to different sections, and its actual price has changed but once—namely, toward the end of last January, when the price all over the country was advanced 10 points. They have been enabled to effect this, first, through their inherent and applied power of control, and, second, through the fact that the volume of production and the quantity used have been reasonably matched.

The complete change in the conditions covering the supply had a marked effect also in quite a different way on the manufacturers. Under the old conditions they all had the opportunity of exercising their judgment in buying and very frequently had the luck, through speculative buying on a rising market, of making much larger profits than their manufacturing margin afforded. But at present that factor of judgment has been entirely eliminated. Not only is the West on about the same basis as the East, but the largest buyer is no better off than the smallest, and the shrewd purchaser no luckier than his less discerning neighbor. The element of speculation among consumers is absolutely dead. In the first place, they are entirely ignorant of the facts which might govern their judgment, nor have they even any guesses as to supply and demand on which to base speculation, and if they had they could not operate very widely, since the paternal authorities will not sell beyond 30 days ahead, and even go so far as to restrain the buyers from overcrowding and decline to furnish them with more than what seems to be a proper supply for their demands. As a consequence they could not speculate if they would, and have to be good children whether they want to or not, with that side of their business a blank so far as any special profits go. The consumers have naturally turned their attention toward making greater profits, through cheapening their processes and increasing the volume of their trade. The result of this has been keen competition and very low prices; in fact, so low as to reduce profits in general to a very low ebb. One of the largest organizations have not paid 4 per cent. on their capital stock, and another one still less, with no large profits to any one.

These influences put the trade into a suitable condition for contracting the "merger mania," and during the past three years there have been as many serious efforts to bring about that result. But up to date they have all proved abortive. The last one, however, appears at present to have a reasonable probability of success. The American Smelting & Refining Company, large as they are, hold a somewhat imperfect tenure of office, and are in reality little else than a gigantic organization of middlemen, of which miners are the first link and the consumers the third link. It would be an easy possibility for the miners to build their own refineries and sell direct to consumers, as has been above indicated, and it would also be possible, but not so easy, for the pig lead consumers to build refineries and become competitive buyers of bullion. Wise heads in the American Smelting & Refining Company fully appreciated these facts and saw readily that the capture of either the link before or the next one after would put them in almost an impregnable position. The former was a task which was by no means easy, but the latter, while presenting obstacles, was more readily consummated. As a result of their efforts it looks at this writing as though nine-tenths of the consumers both of common and corroding pig lead would be merged into one organization, to be known as the National Lead Company. In other words, the managing syndicate, made up of the Morton Trust Company and the leaders of the American Smelting & Refining Company, are to use the National Lead Company as a medium for getting under one roof the entire trade. The company at present have $15,000,000 worth of preferred 7 per cent. cumulative stock and $15,000,000 worth of common stock. The plan is for the National Lead Company to expand their common stock by $15,000,000 par and to issue $20,000,000 of debenture bonds. The directors of the company at a recent meeting so ordered, and the question will shortly be presented to the stockholders of the National Lead Company for their approval. It is assumed that the $20,000,000 of debenture bonds will pay for all the plants which are to be taken in and that the funds obtained from the sale of the common stock will furnish enough capital for the running of the concern. Current rumors say that the bankers have underwritten the common

stock at $25 per share and that those in control own sufficient stock to carry the plan through. In case this matter is brought to a successful issue the position of the American Smelting & Refining Company will be immeasurably fortified against actual rebellion on the part of the miners and independent action by them, and equally against competition from new refineries. With the refining interests practically controlled by them, and the market for lead actually secured, they have shut the doors against competition, except by men of more than usual commercial courage and exceptionally wide and big pocketbooks. They must be men who are not only veterans in the service, but must be intelligent, keen and wily veterans at that, not to be left behind in any such war as would follow, based on the law of the survival of the fittest. The trade at large recognize in Daniel Guggenheim one of the broadest and most competent commercial generals who has ever appeared at the head of his forces.

One of the most interesting factors in lead in 1902 has been the erection of the Federal Smelter at Alton, Ill. It is owned and operation by the Guggenheim Exploration Company, and its intention is somewhat far reaching. Naturally its owners are not publishing any details of their plans, but outsiders are impressed with the belief that the eventual object is to control the entire output of Missouri, and then perhaps swing the affair in under the roof of the American Smelting & Refining Company. This, however, can only be given as common belief, and that view is based on the fact that the Alton smelter has a capacity which is many fold that of the apparently visible raw material supply for its works. If the Alton smelter should secure all the ores and concentrates from the Flat River district, and some of the mines of St. Francois County, it would be kept busy perhaps to its full capacity. The St. Joseph Lead Company and the Doe Run Lead Company, however, are entirely independent and well established concerns and there does not seem to be any likelihood that they can be controlled or any reason why they should be discontented with the existing situation. Their output, which is all smelted by the St. Joseph Company, is more than one-half of that of the Southeast Missouri district and nearly equals 10 per cent. of the product of the country. This lead has been sold independently in the market for various purposes for many years and is well known in the trade. The Desloge Company and the Central Company are also independent, although possibly their ore product might be controlled. The Anchor mine has lately passed into new hands and will be actively exploited and the output increased very largely by the new owners. Nevertheless, it is in the market at a price. The output of Missouri for the past year has not been very far from 75,000 tons and will doubtless increase next year.

Another feature of interest has been the great activity in the matter of rebates on the manufactures of lead made from imported lead ores, bullion or pig lead. As the matter stands at present American manufacturers are placed at a great disadvantage. A reference to the statistics of tonnage shows that during the year 1902 there were exported over 75,000 tons of pig lead which were smelted or refined, or both, in bond in this country. The greater part of this was brought in as base bullion. It also appears that of manufactures of lead there were exported about 5000 tons. It might at first glance be supposed that this startling disparity is owing to the inability of American manufacturers to compete with foreign manufacturers, to differences in cost of delivery between manufactured and unmanufactured lead, or to local sentiment and convenience, which, other things being equal, naturally give the preference to local enterprise. An examination of the laws of the United States and the decisions of the Treasury, however, leads to different conclusions. Under existing law, when a manufacturer has used lead of foreign production upon which duty has been paid to make into an article for export, he may, after complying with the regulations of the Treasury, recover 99 per cent. of said duty. He is required to file a statement showing the details of the importation of the lead and of the exportation of the manufactured article, and to swear that the exported article is made from the identical material imported. This necessitates keeping the materials separate throughout the process of manufacture and of keeping separate stocks, and that adds largely to the cost. It must also be remembered that the Treasury retains 1 per cent. of the duty and that the manufacturers also lose interest on the entire amount of the duty from the date of its payment to the time of its collection, which is seldom less than 60 days and long after the vessel has sailed. These handicaps are by no means all, because, by decisions of the Treasury, when lead is withdrawn from a bonded smelter and the duty has been paid, the manufacturer is not allowed to collect a sum equal to the amount that would have been remitted had the lead been exported in an unmanufactured state. We thus see that by existing law and Treasury decisions pig lead can be sent from this country to foreign manufacturers, who compete with our own in neutral ports, at a lower net cost than that at which the American manufacturer can obtain it after deducting the drawback. Furthermore, the present tariff law provides that materials of foreign production which enter into the construction of vessels built in the United States for foreign account may be imported free of duty; but the Treasury has decided (21,362, July 7, 1899) that no drawback can be allowed on articles manufactured from imported materials when the former are used in the construction of vessels for foreign account, because the delivery of such vessels "cannot be considered an exportation within the meaning of Section 30." Hence all such materials, including what lead is needed for such purposes, will naturally be actually imported as pig lead, although it may be the identical lead which has been smelted in bond here and shipped abroad; the working of the decision of the Treasury apparently is that no American can profitably manufacture goods to be used in vessels built here for foreign account, and so the same are usually procured elsewhere.

Of course it could not be expected that the whole amount of lead which is shipped abroad from this country would under any circumstances go as manufactured goods, but it is confidently believed that under equitable treatment our manufacturers would get their share of the trade of neutral markets. To remedy the difficulties above referred to a very carefully considered and comprehensive bill has been introduced in Congress by the Hon. Wm. C. Lovering of Massachusetts, and there seems no doubt that its enactment into law would be of great value to our export trade not only in manufactures of lead, but in many other articles. It is expected that the bill will become a law. Its main points are:

1. The necessity for identifying the actual material is waived.

2. The delivery of ships built for foreign account to their owners is considered as an exportation, and drawback is then allowed on articles entering into their construction.

3. The drawback on articles manufactured from imported metal refined in bonded warehouses is made equal to the amount of duties which would have been remitted had such refined metal been exported direct from said bonded warehouse in an unmanufactured state.

4. The retention of the 1 per cent. now provided for is curtailed.

Suppose 100,000 pounds of base bullion to be imported to be refined in a bonded smelter. A bond is given for the duty at 2⅛ cents per pound. If 90,000 pounds (10 per cent. being free) are shipped, say, to Germany, the bond is canceled and no duty paid. At the present price, say, 2.25 cents, f.o.b. vessel, New York, this would yield the smelter $2,025.00

If the 90,000 pounds are sold to an American manufacturer, the duty must be paid on 100,000 pounds base bullion, at 2⅛ cents..... 2,125.00

Hence to net the smelter the same amount as above, the American must pay..... $4,150.00

The American manufactures this 90,000 pounds for export and applies for drawback. He is allowed 2⅛ cents a pound on 90,000 pounds, plus 2 per cent. thereof, less 1 per cent.....	1,931.25
Net cost to American.....	$2.218.75
Net cost to German.....	2,025.00
Discrimination against American.....	$193.75

This discrimination shuts the American manufacturer practically out of the competitive foreign markets.

Central Pennsylvania News.

HARRISBURG, PA., December 27, 1902.—Christmas holidays, poor car supply and shortage of fuel combined to make this one of the most discouraging weeks of the year in the steel manufacturing interests of this city and vicinity. At Steelton the Bessemer department, the rail mill and blooming mill No. 1 were out of service all the week, and No. 2 blast furnace more than half of the week. There is fuel on the road and it is hoped to have them working full time by Monday next. The other portions of the works are operating and did not stop for Christmas. While the car supply is poor, the shipments have been somewhat larger than usual from the departments that are working this week from the fact that those out of service do not require cars. All the other iron and steel producers of this district observed Christmas as a holiday and most of them remained closed for the remainder of the week for the purpose of stock taking and repairs. The Lalance-Grosjean tin plant in this city was longest closed and will resume operations on Monday after a lay off of one week.

The work of the Harrisburg Foundry & Machine Company was so satisfactory to the Compania Fundigura of Monterey, Mexico, that an engine which the local works turned out a year ago has been duplicated by the company. The engine is a 300 horse-power machine for electric work and has just been shipped to Monterey. The works also turned out this week one 125 and one 250 horse-power engine for the Hamilton Court Apartment House Company of Philadelphia. M. M. Hershey, the chocolate manufacturer, has ordered a 35 horse-power engine for his Derry Church factory.

The New Jersey Manganese Company ornanized this week at Easton, Pa., with a capital stock of $300,000. J. S. Stewart of Philipsburg, president; G. M. Weller, C. S. Wohrle, secretary, and Clarence M. Beck, the incorporators, and with W. J. Merrill of New York, and H. W. Merrill of Easton, are the Board of Directors. The company will mine manganese and other metals in Clinton Township, Hunterdon County, N. J., where they have large holdings of land.

The Pennsylvania Railroad Company are adding to their locomotive construction shops at Altoona a five-story building, which will be used for the most part for the building of engine tenders. The tenders will receive their finishing touches on the top floor and will be lowered to the first by elevator. The building is of steel and fire proof.

In the offices of General Superintendent of Motive Power Atterberry of the Pennsylvania Railroad Company, at Altoona, plans and specifications for a new style coke car with a capacity of 110,000 pounds have been drawn and were last Saturday sent to the Pressed Steel Car Company of Pittsburgh, who will build a car over them for experimental purposes. If it is successful the Pennsylvania Company will adopt it as their standard. One car of similar capacity and with a patent hopper was built for the railroad by the Pressed Car Company some time ago and has since been tested with great success all over the system. The new car will have several improvements which will enable it to be unloaded in about one-fifth the time it requires to unload an ordinary coke car.

The Cambria Steel Company for the first time in many months closed their works on Christmas and gave their men a holiday, except those employed at the blast furnaces and coke ovens. The Bessemer department will not resume until Monday. The Lorain Steel Company's plant, also at Johnstown, was closed for several days this week.

A large traveling crane to handle metal between the 19-inch mill and the bridge and construction department of the Eastern Steel Company, at Pottsville, is being built. The merchant mill was not operated this week. The company's foundry is being enlarged by the addition of a new building and a new 23-inch mill is being built. The mill will be 140 feet long and 40 feet wide. Snow and rain have delayed the construction work to such an extent that it will be early summer before the new departments will be ready for operation.

The American Turret Lathe Mfg. Company's new plant at Warren was placed under roof this week. The inside machinery will be installed as soon as the building is ready to receive it.

The Downingtown Mfg. Company of Downingtown have shipped to Tonawanda, N. Y., 28 carloads of machinery to be used in the construction of a paper mill.

The Robesonia blast furnace has resumed operations with a limited supply of coal, but the Sheridan stack is still idle on account of scarcity of fuel.

The Leesport blast furnace has been blown in and with the improvements just made will be able to turn out 400 tons of iron a week.

Harvey Auman of Reading, inventor of a patent oil burner for use in manufacturing plants, has been awarded the contract for equipping a brass furnace at Salem, N. J., the plant to have a daily melting capacity of 1500 pounds.

The Baum Separator & Machine Company of Reading have applied to the State Department for a charter, the incorporators being Howard C. Baum, Harvey H. Shammo and Henry W. Stauffer.

The new coke ovens at the Tidewater Steel Works, Chester, are nearing completion. The ovens will manufacture all the coke required by the works and the gas will be sold to the Suburban Gas Company of Chester for public consumption.

The American Road Machine Company of Kennett Square, Pa., made each workman in their employ a Christmas present of a week's wages.

The Middletown works of the National Tube Company have been working little more than half time lately.

The Superior Chain Works of Marysville have booked a large order for a firm in Los Angeles, Cal.

The Duncannon Iron Company's improvements have been delayed by very cold and snowy weather and the plant is being operated with a very limited coal supply.

The Mellert Foundry & Machine Company of Reading have received notice that the United States Senate has passed a bill reimbursing the company to the amount of $2437.84, with interest, retained by the Government for failure to deliver $50,000 worth of iron pipe to the District of Columbia within a specified time after July 12, 1890. S.

Proposals on water wheels and transformers are being received by the Snoqualmie Falls Power Company, Seattle, Wash., aggregating 10,000 horse-power, for the large power plant they are constructing on the White River, a few miles from Tacoma. C. H. Baker, president, advises us that these items will be disposed of in about 30 days. The company have recently placed orders for two 5000 horse-power Westinghouse revolving field generators. The new plant, a description of which appeared in these columns November 20, when completed will represent an outlay of $1,500,000, and is designed to accommodate a 50,000 horse-power installation of water wheels, generators, &c., but for the present machinery for about only 10,000 horse-power will be installed.

W. H. Cullers, president of the Cullers Mfg. Company, Allegheny, Pa., has perfected a new wagon wheel of steel, malleable iron and wood, and will organize a company for the purpose of manufacturing these wheels.

The New York Machinery Market in 1902.

NEW YORK, December 31, 1902.

Standing on the threshold of another year and contemplating the mysteries to be unfolded the mind reverts to the more important events attending the developments of the last 12 months in the machinery industry of this country. There are chapters in this history which it may be highly useful to recall; they may lend some aid in shaping a successful course for the new year.

The Labor Question.

While there has been no extended interference with production due to labor disturbance, in certain localities the Machinists' Union has sought to fortify itself at the expense of the employer. Where the object of the union has been attained the protective organization of the employers has, as a rule, been weak. But the work of organizing employers has proceeded steadily and the results accomplished in this respect have been beneficial to the trade at large. As the strike agitators are centering their efforts where the employers' organization is weakest, and are endeavoring to gain a foothold in ununionized districts, the necessity for action is brought home to manufacturers who have heretofore held that there was no need of their affiliating with the defense organizations because their shops were nonunion. The National Association of Manufacturers is now taking up the labor question, and there is a strong feeling in the trade that in future disturbances this organization will prove beneficial in upholding the employers' side of the case. Throughout the last year the National Metal Trades Association has also been engaged in an active campaign and has achieved handsome results in securing new members. The year 1902 has doubtless been productive of a more universal study of the labor problem than any previous year in the history of this country.

The Machine Tool Trade

serves as a good criterion for gauging the machinery business at large, as when this trade is brisk it is an indication that the building of machinery in general is going on at a good pace. During the last year the volume of machine tool business was greater than ever before. The rapid growth of specialization, under which certain machine tool builders bent all their efforts in the manufacture of one type of tool, or at most a very few, has increased the production of such lines very materially, owing to the practice of putting the machines through the various processes of building in large gangs or lots. In several establishments the lots ran as high as 50 machines or more. This practice, it would seem, must, in any other than extraordinary times, result in the carrying of fair sized stocks of such tools. Nevertheless, throughout the year the builders were unable to acquire any accumulation, as it has been the rule that a gang of machines was completely sold before the machines were finished. Very frequently orders on another lot were booked while the shop was in the midst of the production of a gang.

Heavy machine tools are always scarce, as they are usually built after the order has been placed. The last year, however, witnessed an extraordinary scarcity. Extensive additions have been built to the plants producing them, and the one concern who control most of the large types of machine tools strained every point to facilitate a larger production, but still the demand was greater than the supply. This condition also existed in the traveling crane trade. Machine tool builders were so busy in catching up on orders that the changes in design were not very extensive. Little improvements were, however, made all along the line. Among the most important developments of the year in the machine tool trade were the formation of

The National Machine Tool Builders' Association

and the events which led up to its organization. This subject we have covered at length during the year. That the members are enthusiastic over the benefits to be derived is evident by the following extract from a letter, which recently came to our attention:

"The writer's idea of the National Machine Tool Builders' Association is that its greatest benefit will be along the lines of better acquaintance. Such acquaintance distinctly tends to eliminate from the narrow ideas and narrow ways of doing business. This mere acquaintance, as we have seen in the past few months, prevents buyers from foisting on the manufacturer any old tale they choose to concoct as to prices, terms, concessions, &c., which competitors are making. We have recently investigated two cases of this kind. In one we were most positively assured that a price of $1000 had been made. Our competitor put at our disposal his entire office records, and we found that the price obtained was $1490. The other case investigated was about as flagrant a variation from the truth. We think frequently low prices are made where there is absolutely no call for them, and because of just such stories as we above refer to. We have also found that in certain attachments there is a variation in price of almost two to one, which, of course, is absurd, and indicates that one man's price is entirely too low or the other's entirely too high. To yield a legitimate profit prices should be somewhere within reason, as related to each other. There frequently arises legislation affecting an industry, such as the machine tool industry, adversely, and the voice of such an association would receive much more attention than that of an individual manufacturer.

"We were much interested and rather surprised to note the freedom with which opinions were expressed on concrete commercial questions at the first meeting of the National Machine Tool Builders' Association, such as, for instance, the condition of the export trade. However, as we said at first, above everything, in our opinion, the value lies in a better acquaintance and consequently a broader and more liberal manner of doing business."

Export Trade.

There was little improvement in the demand from abroad, particularly Germany. The extraordinary efforts of German machinery merchants in other European fields have proved a serious handicap to American trade, but as production here was so promptly absorbed by the demand at home, the falling off of foreign trade was not considered seriously. Reports from Germany are not encouraging, and the resumption of activity seems somewhat distant. The German Government is trying to relieve the situation as much as possible, and purchases have been made for the State railways and other Government institutions which were not really required. In South Africa business is rather slow in picking up. The lion's share is going to England. The rush of business from the West Indies, which was expected, failed to materialize, and parties who have visited the field express the belief that development will be slow. From all sides only words of praise have been heard in behalf of the recent Düsseldorf Exposition. It is evident that there were exhibits of interest to Americans, as orders have been placed for machinery to be installed in this country. Quite unlike American expositions, however, the directors closed it at a handsome profit.

Demand from Transportation and Dependent Companies.

The railroads have had an unusually prosperous year, and they have been liberal in their purchases of machinery of all kinds adapted to their use. All of the large transportation systems have increased their shop equipment materially, and a good deal of work has been projected, which will not be carried into effect until early next spring. The Western roads were especially active in buying shop equipment. Of the Eastern roads the Pennsylvania purchased very heavily for increasing the scope of their car shops and also for locomotive shops. The Lackawanna Company have important work in view, as have also the New York Central interests. Incident to the heavy demands on the railroads is the pressure under which the two large locomotive companies have been working in order to furnish proper hauling facilities. The work of the American Locomotive Com-

pany in improving and extending their plants was begun over a year ago. The bulk of the work was, however, accomplished within the last 12 months. Operations were centered principally at Schenectady, where an enormous amount of new machinery has been installed. During the ensuing year it will be good to look well to the South, as the Richmond plant is slated for very extensive improvements, which have not as yet been made. The Baldwin Locomotive Works have heaped additional enlargements upon their colossal plant. Their purchases in 1902 were heavier than during any year for a considerable period. The old rumor of moving this plant from the "heart of Philadelphia" was again to be heard, and was denied just as emphatically as ever. Persistent rumors from various Southern States purported that officials of the Baldwin Works had been looking for a site in that locality. Judging from the extent of the improvements under way it is quite evident that the works will remain in Philadelphia for at least a few years longer.

From car manufacturing plants of all sorts the demand for machinery has been heavy. The steel car industry continued its expansion, and a large plant of this type is now being projected for upper New York State. It is stated unofficially that this plant is to be operated in harmony with the Lackawanna Steel Company, from whom it will obtain its supplies. Vanderbilt or New York Central interests are also said to be connected with it.

Shipbuilding plants have not been particularly active in the purchase of equipment during the last year. The large companies have, of course, added considerable machinery, but none of the proposed plants which were so widely heralded a year or more ago have materialized. It is probable, however, that the next year will bring the erection of a good sized plant in Southern Atlantic waters. It is doubtless true that the formation of the United States Shipbuilding Company, who absorbed two or three of the large plants and as many smaller ones as well as the Bethlehem Steel Company, prevented a considerable amount of contemplated improvement.

Pneumatic Tools and Air Compressors.

The most important event in the pneumatic tool trade was the consolidation of several companies or the widening of the scope of the Chicago Pneumatic Tool Company. It will be recalled that the only pneumatic tool company in this country taken in by the Chicago Company was the Standard Pneumatic Tool Company. The other concerns involved—namely, the Chisholm & Moore Mfg. Company and the Franklin and New York Air Compressor companies—were simply for extending the line in other branches. There are other important interests outside of this consolidation, so that it cannot be said that the pneumatic tool industry is in the hands of a controlling combination. All of the companies have had an exceedingly prosperous year. The great activity of the structural steel trade has occasioned a heavy demand for pneumatic tools. They are being more universally used in boiler shops and in foundries. Large orders have been secured abroad and the demand in foreign countries is deemed of sufficient importance to warrant the erection of large plants in Europe for the production of American tools.

The Philadelphia Pneumatic Tool Company built an entire new plant in Philadelphia which has recently been completed. Pedrick & Ayer of Philadelphia have now in course of construction a very large plant at Plainfield, N. J., which is to be devoted to the production of pneumatic tools and compressed air machinery of all sorts, particularly such as is used by railroad companies. The railroads have, of course, been extensive purchasers of pneumatic tools as well as air compressors. The use of compressed air has been extended somewhat during the year and hence an increased business in air compressors. In the very large compressors used in mining work the Allis-Chalmers Company had a good year and a number of good sized orders were obtained in South Africa.

Power Plant Equipment.

Most conspicuous in this line has been the advance of the turbine generator. It can safely be said that the year under review saw the acceptance of the steam turbine as a commercial factor in this country. Prior to last year those which were installed were considered simply as experimental. A number of good orders were placed by well known manufacturing companies for generating sets of this type during the last few months. The advent of the General Electric Company into this field is also actually a development of 1902. This company have entered into contract with some of the largest electrical companies, who will install turbines of large power as soon as they can be delivered. For the production of the machines the General Electric Company have purchased a large amount of machinery to be installed in a new turbine shop at Schenectady. The first order for these machines was placed by the Commonwealth Electric Company of Chicago. The turbine, it is expected, will be in operation very shortly and the engineering fraternity is awaiting anxiously the news of this event. This plant is to be an exceptional one in several respects. It is also to furnish an example of the advantage of superheated steam. Since the placing of the order for the first turbine for the Chicago plant several duplicate contracts were awarded.

The advancement of the steam turbine has also brought with it marked strides in condenser practice. It is predicted that remarkable results may be looked for in this connection at the Commonwealth plant. The building of the monster power stations in New York has afforded builders of reciprocating engines of large units an opportunity of matching their skill. These plants also offer excellent tests for various condenser and feed water heating systems. They will also soon show the turbine generator in operation side by side with what is deemed the acme of present practice in reciprocating engines, for one of the large electric companies has contracted for a General Electric turbine set of something like 8000 horse-power. The acceptance of the steam turbine in large units by the big electric companies is the fruit of the latter portion of 1902. An evidence of the fact that engineers were still somewhat skeptical early in the year is found in the equipment of the great station from which the energy for operating the New York Subway system will be obtained. It is a fact that early last year, when contracts for this equipment were in order, the engineers in charge received an offer of an entire turbine system which, if accepted, would have almost cut the cost of the generating sets in two. Contracts were, however, placed for reciprocating engine and generator sets, despite the greatly higher cost. The ensuring year will see turbine sets of large units in operation in various parts of the country, and within another year a proposition such as was offered to the New York Subway constructors will receive far greater consideration than did the one which was made in 1902.

The contracts for the equipment of the subway power station were the only very extensive ones awarded last year. The next year will have the two stations for the Pennsylvania tunnel project and the station for the electrical operation of the New York terminal of the New York Central & Hudson River Railroad in store for builders of all kinds of power station equipment.

The engine and boiler trade in 1902 was active. A number of good contracts were given out and the demand for units of smaller and moderate sizes was excellent. The capacity of practically all of the engine plants was increased considerably and the increased product was fully absorbed by the demand. The great new Allis plant was placed in operation toward the close of the year, and the new boiler factory of the Babcock & Wilcox Company and the extended Aultman-Taylor plant were also taxed to their utmost.

Large Gas Engine Units.

The radical departure from existing practice in this country made by the engineers of the Lackawanna Steel Company in adopting gas engines throughout their immense Buffalo plant has introduced another new element into American engine building. It is estimated that they have ordered within the last year more than

$3,000,000 worth of gas engines. These engines are to be of the Körting type and only a little more than half the orders have been awarded. We are informed that the plant is to eventually employ about 102,000 horse-power, while the orders thus far awarded aggregate but 60,000 horse-power. The engines are all being built by the De La Vergne Refrigerating machine Company of New York. A review of the successive orders indicates the inclination toward larger units. At first an order was placed for eight 1000 horse-power units; then 16 2000 horse-power engines were contracted for, and recently four engines of 5000 horse-power each were purchased. Designs are now being made for an 8000 horse-power unit and it is expected that contracts will shortly be made for a number of engines of this size.

Electrical Equipment.

No better indication of the enormous demand for this class of machinery can be obtained than is furnished by the plants themselves. During the year 1902 all of the well-known electrical establishments have been increased considerably. And now at the opening of the new year comes the news that the Westinghouse Company intend to double the capacity of their great works. The heavy consumption of electrical apparatus, with its attending increase of electrical works, has also been a large source of consumption of machine tools and other classes of machinery. To the more universal operation of machine tools by electric motor the increased demand for electrical supplies is largely due. Another factor which cannot be lost sight of is the tremendous operations of the last year in the erection of great office buildings. Each of these structures has necessitated the installation of an electric plant of sufficient capacity to light a town of fair size. And then, as a factor of safety in almost all cases, duplicate plants were installed. This, by the way, also figured largely in placing increased pressure upon the builders of high speed automatic engines.

Steel Plants.

From the reviews of the great strides made in 1902 in the steel industry, given elsewhere in this issue, it must be seen that an enormous quantity of machinery was absorbed. Among the most striking illustrations of the year's activity, the Lackawanna Steel Company and the Pennsylvania Steel Company occupy conspicuous positions. Mention of the latter's operations at Steelton, for which a good deal of machinery is still to be purchased, brings to mind the heavy purchase made for numerous bridge and structural steel plants.

Consolidations.

In the matter of consolidations, the last year brought forth little that affected the machinery trade directly. The proposed consolidation of builders of cranes and carrying machinery, which, in its last stages of projection, also contemplated the absorption of machine tool and other interests, failed. At present operations in this direction are off. There were, however, several combinations of concerns who are extensive users of machinery, as, for instance, in the brake shoe, screw, woven wire fence, harvester and other industries.

The Cement Industry.

There was remarkable activity in the cement industry, which occasioned extensive purchases of machinery. The Atlas Company doubled their plant and the Lehigh Company are doing the same, as are also the Coplay interests. Numerous smaller plants are built and a great many of them are projected. The Quaker Company, the new branch of the Northampton or Standard Oil Company, will require a large equipment early this year. The demand for cement is still so far in excess of the supply that large importations are being made. In this connection the increased use of concrete construction, principally for track elevations being made by railroads and for use in the erection of the great office buildings, figures as the chief factor. A great quantity of cement will be consumed in the construction of the proposed Pennsylvania Railroad tunnels crossing the North and East rivers and Manhattan Island, as it is planned to surround the tunnels with a casing of concrete.

The Eight-hour Day and Metric System.

An important matter which 1902 brought to the surface, but failed to settle definitely, is the adoption of an eight-hour day by the Government on contracts performed for it. This subject has interested machinery builders vitally. They have opposed the measure energetically, but fear that their point may be last. The possible adoption of the metric system by this Government has also concerned machinery manufacturers, as was evidenced by the animated discussions at the various engineers' and machinery builders' meetings held last year.

The New Year.

From what has been said in the foregoing, it will be observed that there is little need of apprehension regarding the prospects for 1903. There are numerous large projects which have reached the stage of launching and which will prove enormous consumptive channels for machinery of all sorts. The railroads are in a most prosperous condition and to keep abreast with the requirements made upon them they must add to their equipment and to its maintenance. Passenger transportation service in many large centers of population is entirely inadequate and must be increased during the year. Municipal water works plants, sewage systems and in many cases lighting plants must be increased, and for the fulfillment of all of these wants machinery must be employed. In short, the year promises great constructive and consumptive requisitions, which should blot out fear that the heavy demands on productive account will soon prove a menace. The control under which the boom tendency has been kept in the last year should prove of inestimable benefit in the new year, which, even though it should bring a gradual slowing up of pace, should prove a healthy and prosperous one in the machinery industry of this country.

The Philadelphia Machinery Market in 1902.

Continuous activity in all branches of the machinery market has been the feature throughout almost the entire year in Philadelphia. Many manufacturers entered the year with order books comfortably filled, and the favorable conditions which were continued from last year have been uniformly maintained. There was no decrease in demand, and orders were taken freely, except at certain times when influences outside the trade interfered. These, however, were only temporary and in almost every case the amount of business taken during a month or so following more than overbalanced any previous recession.

Manufacturers in some cases reached a condition of "too much business," and a temporary diminution of new business under the existing conditions was not unwelcome. The amount of work on hand has kept manufacturing plants running at utmost capacity continuously, and their various employees have had a year of steady employment. As usual the falling off in demand has been noticeable during the closing month of the year, as both manufacturers and their customers prepare for their usual stock taking on January 1 and anything not particularly urgent is generally deferred until after that date.

Owing to the volume of business and the pressure of purchasers to obtain deliveries, not only have most manufacturing plants been operated to their best capacity, but many improvements have been made, additions have been built, new equipment added and changes made in order to facilitate work in every department. The aggregate of these improvements has been large and has extended to almost every plant, large and small, engaged in the manufacture of tools and machinery, as well as to those engaged in other lines.

It was not all smooth sailing during the year, great drawbacks having been caused by the inability to obtain anything like prompt delivery of raw materials. Iron

and steel have been scarce almost throughout the entire year, but some relief was obtained by importations of foreign material, which, although not entirely suited for all requirements, was at least a considerable help and has improved with acquaintance. What caused most anxiety to manufacturers, and at some plants a temporary suspension of operations, was the scarcity of fuel due to the strike of the miners in the anthracite regions. Anthracite coal was consequently very scarce and for a while was entirely out of the market. This caused a heavy demand for bituminous coal and for coke, both of which advanced materially in price, and it became equally as hard to get deliveries of them. While mining operations have been resumed pending settlement by the commissioners appointed by the President of the United States, the supply is totally inadequate to the demand and it is only by constant vigilance that supplies for continuous operation of some plants can be maintained.

Deliveries.

Deliveries on machinery and machine tools have been generally unsatisfactory to the purchaser. During the first half of the year they were very much delayed. Some little improvement was noticeable during the latter half, but only in particular lines, such as the standard medium sized and small tools, while deliveries on heavy machine tools continued more or less uncertain. Transportation has also been unsatisfactory, delays of 30 days and more having been frequently noted in the time of deliveries. The inability to obtain raw material and supplies with any degree of promptness was, however, the main cause of delay. The shortage of pig iron, as well as coal and coke, handicapped both iron and steel casting plants and caused vexatious delays. Foreign iron helped some, but was not satisfactory in all cases. Two or three months for deliveries of castings in the rough does not tend toward an early completion of a machine or tool. The fuel question has also been one of great concern, the inconvenience of changing from the use of anthracite to bituminous coal, together with the difficulty, owing to the increased demand, to obtain even the latter fuel with any degree of promptitude or certainty, having done much to interfere with regular shipments. These drawbacks, together with a large amount of work on hand, have been responsible for many belated deliveries, and compelled manufacturers of heavy machinery and special tools to promise no definite dates of shipment, but to make time of delivery subject to conditions which may intervene.

Export Trade.

There have been no developments worthy of note in the export machinery trade during the past year. Conditions have been unfavorable, both at home and abroad, and little new business has been done. No tendency is apparent at the present time toward any general resumption of this class of trade, but with continued activity in the home markets there is no incentive for an energetic search for business abroad, particularly when it is impossible to supply even the domestic trade promptly. Prices have also been of some moment and at the present level of raw materials, combined with the high rate of wages, it is difficult to secure foreign trade with any margin for profit. There has, however, been a continuation of business in certain lines which have established connections, and while this, owing to unfavorable conditions, has probably not been as constant as could be desired, manufacturers are fairly satisfied with the amount of business taken. An exception might be mentioned in the case of pneumatic tools and machinery, which have, particularly during the last half of the year, been exported quite largely. But no indications are apparent which give promise of any early resumption of a foreign demand for our machinery.

Improvements Made to Plants.

Many improvements to plants which had been previously planned and started have been completed during the year, and the continued demand for machinery and tools has in many instances compelled still further improvement to some of the same plants. The equipment for these has been extensive and some very large expenditures in this direction have been made. The extent of these various improvements has in some cases been very noticeable. The Baldwin Locomotive Works have been continuously improving their plant, large numbers of machine tools and special machines having been purchased and installed, and the result of their efforts is evident in their production. In 1899 this plant produced 901 locomotives, in 1900 they increased to 1217 and in 1901 to 1350, while the total for the past year reached 1530, of which number 74 were electric engines, 99 were for export and 424 were of the Vauclain compound type. These figures will be largely increased during the coming year with the completion of the improvements now under way, as it is expected to increase the production to 40 engines per week, or an increase of about 33 1-3 per cent. To accomplish this the company have during the past year (including the work now under way) expended for building and machinery nearly $1,500,000.

Some of the builders of electric cranes have also been compelled to further increase their capacities. The Niles-Bement-Pond Company have during the past year added new buildings to their crane shop at a cost of over $150,000, while for the equipment of the same over $100,000 has been expended. This plant, which has had a capacity of four cranes a week, will as soon as the additions are completed increase its capacity to one crane a day.

Very extensive improvements have been made locally, as well as at other points on their line, by the Pennsylvania Railroad Company. Large amounts have been spent for increased terminal facilities in this city, and the removal of their repair shops from Wilmington to Shelpot, Del., with the necessary enlargement, has been of particular interest to the trade. The Philadelphia & Reading Railroad Company have also built and completed during the year a large new shop at Reading, Pa.

Improvements to other plants have been numerous, almost every shop, large or small, having been compelled to increase in one way or another in order to keep up with the heavy demand and which bids fair to continue indefinitely. The Philadelphia Pneumatic Tool Company completed and are occupying an entirely new plant, and the Keystone Drop Forge Company will early in the spring move to a new plant now building at Chester, Pa., which will enable them to more than double their present capacity.

Many local and nearby foundries have also been compelled to increase their plants in order to meet the large demands of their trade, while a number of new plants have begun operations. Steel foundries continue to be overwhelmed with business and continuous enlargements have been made to some plants. One of the new steel castings plants of the year is that of the Diamond Drill & Machine Company, Birdsboro, Pa., which has just gone into operation.

Shipbuilding.

A very active year has been experienced by the various local shipbuilders. The yards have been uniformly busy, employing a maximum number of men, and a large number of vessels have been launched, while others are still in course of building. Improvements to facilitate their various work are being made continually at these plants, while some extensive work in the way of dry docking facilities to be built next spring is talked of at one of the Delaware River yards.

The Machine Tool Trade.

Business in this branch of the machinery trade has been active throughout the year. The equipment of new plants, as well as additional requirements for extensions to shops, has been large and the demand for replacement of older types by modern machine tools has been such as to keep many manufacturers continuously busy and far behind in deliveries. Requirements continue to run to the heavier types of machines, particularly in the lines of planers, lathes, boring, milling and drilling machines, which grow larger and heavier as their various work increases. The standard and efficiency of machine tools generally continue to increase, and the demonstration of their ability to perform satisfactorily the work for which these large tools are being designed

has greatly augmented their use. The demand for them has therefore correspondingly increased, and manufacturers of heavy tools have had more than enough to keep them busy all through the year.

Difficulties in obtaining raw materials have been experienced by builders of these tools and unforeseen delays have interfered greatly with deliveries. Every indication at the present time points toward continued favorable conditions for this branch of the trade, and the capacities of some plants are booked for a considerable time ahead.

Engines, Boilers and Smaller Tools.

The demand for this branch of trade has been good, particularly in the lines of engines and boilers, both large and small. The same conditions which have pervaded the trade generally have caused an active demand for engines and boilers. A large number have been taken for new plants and replacements have been many.

The smaller machine tools have also been active, but there have been periods during the year when the demand in this branch of the trade has fallen off. Manufacturers were enabled to catch up in a measure on their orders, and stocks on dealers' floors assumed a better appearance. Prompt deliveries therefore could be made on this class of standard tools, and more particularly during the last half of the year.

Prices.

Prices during the year have not been all that some manufacturers could desire. That a very large business has been done is admitted, but it is claimed that profits have not been commensurate. The conditions regarding raw material have been uncertain almost throughout the year. In many cases purchases had to be made at prices very much higher than what was figured upon when quotations were made, and this added to the cost of the tool. Labor has also been advanced in many instances, and almost everything that enters into the cost of a machine or tool has increased in cost. There have been some advances in prices at various times, but that they have not been proportionate with cost is claimed by some who are anxious to see a higher level. Fairly steady has characterized the conditions during the past few months, with very little tendency to cut prices.

Outlook for 1903.

The conditions for the coming year's business may be said to be generally satisfactory. A large number of orders have already been taken, while inquiries have been good and indicate a large quantity of business to be placed early in 1903. A good amount of machinery and tools will be taken by the various railroads for the equipment of new shops now building and for replacement, while the demand for rolling stock and motive power is exceptionally large. A number of plants have orders booked for deliveries during the first half of the year, others have work on hand for some three months steady running, while some are not so busy but have a very satisfactory day to day business coming in. With general conditions favorable there seems therefore to be no apparent reason for expecting anything but a satisfactory volume of business during the coming year.

Buffalo Harbor to Be Improved.—Contracts have been let for the deepening of the Erie Basin in the harbor at Buffalo to a depth sufficient to accommodate the largest modern vessels. These companies have the contracts: The Lake Erie Dredging Company, the Donnelly Contracting Company and the Buffalo Dredging Company. A large portion of the work will be in rock, requiring the use of submarine drills. The improvement of the basin is part of the gigantic scheme to make Buffalo's harbor facilities commensurate to its needs for the handling of the growing business of the Eastern terminal port of the great lakes.

Freight rates on pig iron from the Virginia furnaces on the Cincinnati & Ohio Railroad to the North and West will advance January 1 50 cents per ton, and from the Southern furnaces to points North of the Ohio River 10 to 20 cents per ton.

Leading Metal Manufacturers on the Eight-Hour Law.

A Series of Interesting Letters.

WASHINGTON, D. C., December 30, 1902.—The programme of the advocates of the original eight-hour bill with reference to the amended measure reported by the Senate Committee on Education and Labor has been practically agreed upon. If a favorable opportunity offers an effort will be made to substitute the House bill for the Senate measure; if the attempt fails the Senate bill will be urged to its passage, if possible, with the expectation of either remodeling the bill in Conference Committee along the lines of the original House measure, or securing the entering wedge of more comprehensive legislation in the next Congress by the enactment of the Senate bill. The details of the plan to be pursued are now being worked out by the council of the American Federation of Labor and will be perfected by the time Congress reconvenes on January 5, 1903.

The examination by the labor leaders of the Senate bill as amended has developed the fact that there is a strong minority who favor exhausting every resource to secure the substitution of the House bill and the open denunciation of the Senate measure as an unworthy makeshift for political purposes only. These extremists advocate standing by the House bill in spite of the reflection cast upon its constitutionality by the report of the Senate Committee, asserting that if the House bill is abandoned and the Senate measure accepted it will be impossible in the next Congress to secure consideration for a measure of broader scope. As stated, however, this element is in the minority at present at least, while the majority believe that it is the part of wisdom, if nothing better can be had, to accept a bill which recognizes the principle of the eight-hour day as applied to work for the Government by private contractors who are not actually employed on land owned by the Government.

The purpose of the labor leaders to substitute the House bill for the Senate measure, if it can be done, gives much point to the protests which the Senate Committee is now receiving from prominent manufacturers in all parts of the country, directed primarily against the House bill, but in a general way against any legislation designed to force an eight-hour day upon the industries of the United States. Following are brief abstracts from communications received from leading concerns in the iron and steel and allied trades:

Baldwin Locomotive Works, Philadelphia.—The effect of the bill will be to prevent manufacturers from bidding at all upon Government work unless their hours of labor upon all other work are in conformity with the Government requirements. We are of the opinion that the country is not ready for such a measure and that its passage at this time would be disastrous. This opinion is based upon the following reasons: In order to produce at low cost and bring American articles of manufacture within the reach of all purchasers, both at home and abroad, while at the same time maintaining the high standard of wages now paid to American workmen, it is necessary to operate industrial works without cessation both day and night, excepting Sunday. The large machinery and appliances, upon the use of which our industrial supremacy is based and for which our workshops are becoming famous, and, furthermore, upon which the ability of manufacturers to continue to pay high wages to American workmen must depend, must necessarily be operated continuously in order to enable the highest output to be obtained. This being the case, the hours of labor must be so divided that the day turn and the night turn of workmen must have their hours of labor so arranged as to divide between them the duties of their positions and the profits derived from competitive working. Any cessation in many of the processes would not only mean great loss to the manufacturer, but greater proportionate loss to the workman.

The greater portion of all labor is now done upon a

piecework basis, independent of the hourly time rate. Great trouble would often ensue if workmen were not permitted to complete their tasks. The Government would find it difficult to purchase much of its machinery and supplies from American workshops. The restrictions already established in connection with Government work make it less desirable than work procured in the open market from private purchasers. Were the large workshops throughout the country to be restricted to but eight hours of labor out of 24 on such work, many would find it unprofitable to quote for it and the competition would be restricted to a few concerns working almost exclusively upon Government contracts. We are of the opinion, furthermore, that the proposed legislation will tend to place our manufactures in a position unfavorable to the continued growth of our foreign business. The general adoption of the eight-hour day cannot be made except by concurrent action of different countries, unless the country first adopting it shall voluntarily exclude itself for the time being from international competition.

Pratt & Whitney Company, Hartford, Conn. (Machine Tools).—As manufacturers we wish to call your attention to the serious effect this bill may have upon ourselves, and if so upon nearly all, if not all, other manufacturers, and without being prolix would state our reasons: 1. No Government contracts could be taken by our firm without operating the entire works eight hours per day, and considering the small amount of Government work which we do (and possibly we do as much as any one directly in our line) we would not be justified in accepting this Government work except for an excessive price, seeing that it would create dissatisfaction among the employees and would cost us a great deal more directly and indirectly than we could do work for any other parties. Indeed, we are not sure that we would be justified in accepting an order from the Government at any price in the face of this bill. 2. Manufacturing at present close margins, and they are close even in the face of a very large volume of business being offered, can only be remunerative if an establishment is operated to its full capacity. If the eight-hour bill were introduced and made effective we could not conduct our factory except to the limit of the possible requirements of some department; and as the requirements of each department vary from day to day and from month to month, we could never keep the shop balanced up if working only eight hours a day. We have, in order to keep the works actively engaged, to work in different departments overtime occasionally, and frequently in some of the departments, to even up and keep the whole running smoothly and to full extent. If the privilege to do this is debarred from us by this bill it will interfere seriously with the manufacturing prosperity of the United States, for we are quite certain that the conditions and difficulties which present themselves to us as manufacturers will be found to exist in nearly all other similar institutions.

We need not enlarge upon the advantages or disadvantages to the workmen; it is in their interest that the bill is being pushed, or at least their supposed interest. We take it to be an entire mistake that it is to the well being of the workman, and believe that there is no other country in the world in which the workman has been given so many advantages or such kindly treatment and such good wages as he has in the United States, and we think, apart, of course, from the grasping disposition of individual manufacturers, that there will be a stronger friendly feeling between employer and employee as time progresses. The writer has been apprentice, workman, foreman and manager for 45 years and is therefore capable of appreciating the vast change which has taken place in the feeling between employer and employee. Don't retard this by the enactment of law.

Westinghouse Electric & Mfg. Company, Pittsburgh, Pa.—To attempt to carry on Government work under this bill would disorganize the entire system of production in any works organized on the most efficient modern plans. To make this perfectly clear, we may explain that in modern American manufacturing covering a great many of the articles which the Government buys it has been found that the highest efficiency of production which secures the lowest cost to the consumer is based on the specialization of manufacture, so that all possible machines are standardized and are manufactured in large quantities. The individual parts of machines are made without reference to any particular machine of which they will afterward form a part, because all of a certain kind will be prepared for any machines of certain sizes which are manufactured, no matter what their ultimate destination. To follow out the provisions of this bill in doing work for the Government would mean that this highly efficient system of manufacture would have to be abandoned, as far as the Government work is concerned, and each piece, however small, would have to be made by an employee working on the eight-hour basis.

We would call attention, also, to the fact that the system of specialization makes any manufacturer dependent on a large number of others, whose finished product is his raw material. For example, a large electrical manufacturer gets, as finished product from others, copper wire, copper shapes, sheet steel, steel castings, malleable iron castings, insulating material, porcelain, rubber, &c. Under the provisions of this bill, although these manufacturers would have no contract with the Government and their product would be turned out in absolute ignorance of its ultimate destination, yet if it were used in machines made for the Government and the limit of hours was exceeded the penalty would become operative against the contractor. In other words, the effect of the bill would be very far-reaching, and it seems to us would be almost intolerable.

Altogether, apart from the exact number of hours, this bill would work an injustice to workmen in forbidding overtime work. For such work it is the custom to give a higher rate of pay, so that the workman has a special inducement to do such work when opportunity offers. It is inconceivable that any large body of workmen should object to any opportunity to earn this increased compensation.

The manufacturer has a direct interest in the possibility of overtime work, as it gives needed elasticity to the system of hours. The necessity for such work cannot always be foreseen, so that it is impossible to take care of it by employing extra men. It is, of course, impossible to keep men on hand normally idle to provide for an extra rush; and men who would be available for such short time work would be of inferior ability. The overtime system enables the skilled man to finish a job on which he is working and which has to be pushed through. It may also be mentioned that in prosperous times (when overtime is needed) it is almost impossible to get men enough to do the work even with overtime. What would result if overtime is penalized? The answer is obvious.

We believe it worthy of the committee's attention that the effects of this bill will be to offset to a large degree the splendid system of shop organization which has enabled our country to take the front rank in manufacturing. Careful and competent observers, who are familiar with the conditions in our own and other countries believe that our success is due very largely to our shop methods. The more enlightened foreign manufacturers are coming themselves and sending their managers, foremen, and even workmen, to study our methods. When we have this remarkable testimony to the excellence and efficiency of our existing practice, is it not unwise to think of enacting a law which will undoubtedly hamper and reduce this efficiency?

Illinois Steel Company, Chicago.—Mr. O'Connell's statements concerning the Illinois Steel Company as given in the hearings on the proposed eight-hour bill are very misleading. Instead of there being a large proportion of our men on the eight-hour basis, as Mr. O'Connell's statements might infer, the facts are that in our mills at South Chicago, Joliet and Milwaukee, where we employ approximately 10,000 men, there are less than 600 men now working on an eight-hour basis. To put it specifically, our records show only 5.66 per cent. of our total force so employed. Though these men are generally filling positions where the greatest heat is

encountered, I believe that most of them would be able to fill their positions more satisfactorily to themselves and to the company if they worked on a twelve-hour schedule instead of eight hours.

Garvin Machine Company, New York (Machine Tools).—We are manufacturing machinists, employing about 600 hands. Last year about 7 per cent. of our sales was to the Government on contract work. We could not bid on Government work in the event of the passage of this bill, as any efforts made to adapt the operation of the factory in conformity to the requirements of the bill would simply result in such disorder, dissatisfaction and confusion that it would be impracticable to run on such a basis. We are handicapped here in New York as it is, running as we do on a nine-hour schedule, while our competitors in other States are running ten hours. Had Congress the power to enact a universal eight-hour day, and such a workday still enabled us to compete with foreign manufacturers, it would be different; but Congress has not this power, and hence such discriminating legislation is at least unjust, if not unconstitutional. Congress might, with equal propriety, not only arbitrarily fix the workday, but as well the standard of the workmen to be employed and the pay they were to receive, designate that they have vacations, &c., and where would this drift to? The Government may as well go into the business now of out and out paternalism, and hasten to the days that Bellamy dreamed of in his Looking Backward, for outside or individual operators could not operate their works subjected to the restrictions imposed.

Crucible Steel Company of America, Pittsburgh, Pa.—We employ about 10,000 men, and emphatically deny that we operate under any eight-hour arrangement, and earnestly protest against the passage of the House bill 3076, now pending.

Cleveland Twist Drill Company, Cleveland, Ohio (Drills, Tools, &c.).—As manufacturers of tools which are largely used in Government armories, shipyards and on board ship in the navy, we wish to enter our protest against the eight-hour law. We cannot, unless all other manufacturers in this same line of business adopt an eight-hour day, avoid becoming directly or indirectly responsible and liable under this law. Our goods are manufactured and shipped to the jobbing hardware trade throughout the country. These jobbers bid on specifications furnished by the Navy Department, and it rarely happens that an order is placed by the Government directly with the manufacturer, and we would thus be furnishing goods to the Government on which we might be liable for fines under this law. To avoid such fines it would be necessary for us to insist upon it that no customer should bid on a Government contract, which would handicap us in our competition with other manufacturers who are not alive to their responsibilities under such an act. We think that this law would not only work a hardship on the manufacturers of this line of specialty, but it would also work a hardship on the workmen themselves, as all our prices are based on a ten-hour day, and if the factory runs less than ten hours the pay of each operator is reduced proportionately to the time the factory runs. It seems to us also that this law would be unconstitutional, as it would prevent the employer and the employee contracting for a given length of time of service per day which might otherwise be entirely agreeable and in fact very desirable for both parties. All the manufacturers in our line of goods are doing a fairly handsome export business. We are at the present time being crowded very hard in the foreign markets of the world by German manufacturers who, by reason of very much lower wages paid per man and the fact that all European countries have a tariff on the class of tools we manufacture, are able to undersell us in most of the foreign markets, and the only thing at the present time that enables us to compete at all with the German manufacturers is the fact that most of the American goods in this line are superior in quality to the German makes. If we are compelled to run but eight hours a day we will be eventually compelled to pay more per hour for our labor, and would then be so handicapped as to cost that our goods would eventually be driven entirely from the European markets.

Newburgh Ice Machine & Engine Company, Newburgh, N. Y.—Please note the disastrous effect of the change in our establishment, or any others similar in character, from a ten-hour to an eight-hour basis (remembering that a mechanic's or laborer's wages are universally adjusted or equalized in all trades, so that he may comfortably support himself and family; therefore there could be no decrease of wages), which means ten hours' pay for eight hours' work. As a matter of fact, it means that wages must eventually (in case the eight-hour law goes into effect) be further increased, owing to the increased cost of all the necessities of life which the eight-hour law will inaugurate. Example:

Ten-Hour Basis.

(Output, $200,000; investment, $200,000.)

Mechanics' pay roll	$100,000
Raw material	60,000
Operating expenses	30,000
Profit on investment	10,000
Total	$200,000

Change to Eight-Hour Basis, Decrease of Capacity as 8 is to 10.

(Output, $160,000; investment, $200,000.)

Mechanics' wages	$100,000
Raw material	60,000
Operating expenses	30,000
Total cost	$190,000
Total sales	160,000
Deficit	$30,000
Loss of profit	10,000
Total loss	$40,000

Note while our output on eight-hour basis is $160,000, calling for the purchase of $48,000 worth of raw material; that then, of course, on account of universal raise in prices would be $60,000. If this was the case the raw material and labor will probably be the same as on the ten-hour basis. The operating expenses necessarily would be the same, as the office force, insurance, and the thousand and one items covered by the term "operating expenses" remain the same. W. L. C.

The Third Rail on the New York Elevated.

Commenting upon the recent tie up of the New York elevated roads, due to sleet forming on the third rail, the *Electrical World* says:

When we remember and recall how magnificently Mr. Vreeland has handled the Metropolitan Street Railway system in New York in violent snow and sleet storms, catching the flakes even before they could reach not merely his third rail, but his fourth, below the level of the swimming streets, it is too late for the Manhattan people to convince us or anybody else that the third rail is a failure on a track free from every possible obstruction and accessible to the promptest removal of, and prevention of clogging by, ice or snow. The third rail will yet be improved upon, but we insist that it is a splendid success in competent hands, and we refuse to have the Manhattan slackness and fizzle regarded as proof of what energetic management can do with appliances already approved in Chicago, Boston and other places. There are various forms of third rail, and the tardy discovery on the Manhattan system that one of the simplest styles can be knocked out by a trivial "cold snap" is altogether too preposterous to be allowed for a second. If there are better methods, for sectional operation, for housing the rail, or for scraping the contact head—and we can readily believe in such improvements—we still contend and insist that there was no excuse for the frightful inconveniences caused last week. Those inconveniences are after all but in keeping with the record of the past—the miserable station management, the wretched lighting, the incessant delays, the quick interruptions of the express service, and half a dozen other features of gratuitous discomfort. It has been said that the parsimony of Mr. Sage was largely to blame for all that; but now that he is happily removed from further opportunity of distressing his fellow citizens, it is devoutly to be hoped that others, if equally responsible, will disappear under the new *régime*. We are entitled to expect better things.

The Iron Age

New York, Thursday, January 1, 1903.

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CHARLES KIRCHHOFF, - - - - - - - - - EDITOR.
GEO. W. COPE, - - - - - - - - - - ASSOCIATE EDITOR.
RICHARD R. WILLIAMS, - - - - - - - - - HARDWARE EDITOR.
JOHN S. KING, - - - - - - - - - - BUSINESS MANAGER.

The Outlook for 1903.

Conservative men in the varied branches of the metal industries look forward to the developments of the current year with serene confidence. Really many have for months acted upon the conviction that good times will continue, since they have made commitments extending in some instances into the second half of 1903, and in exceptional cases into the year 1904. To a certain degree these are really little more than options, whose significance should not be overrated. We have seen them vanish in days of panic, or have had them cut down seriously on a rapidly declining market. Reports relating to tonnage of orders booked are valuable as furnishing an indication, but they must not be cited or be accepted as proof of future consumption.

Broad generalizations are dangerous, since they may be misleading, but the feeling seems to be general that the climax in prices and possibly in volume of business has been passed, that a readjustment of the values of those lines is necessary where it has not already occurred. The "boom," fortunately kept within bounds, is over, but the fear of a sudden collapse, too, has disappeared and the return to a sounder condition by gradual stages is expected. Producers of iron and steel have been caught quite unprepared to meet the enormous expansion in the requirements of the country which was the feature of 1902, and the result has been that there have been vexatious and costly delays. It is impossible to express numerically the extent of the deficiency, because the volume of the imports alone does not measure it. To get at the correct figure we would have to know how much the deliveries of material have been delayed in the aggregate. It is probably safe to say, however, that the quantities involved do not bear a very large proportion to the total requirements of the country. If that be true, then the efforts being made to restore a balance must be successful as soon as better facilities for transportation are supplied and new capacity for the production of raw materials and finished products falls gradually into line.

It is unnatural that a country like ours should be importing heavily of iron and steel. We cannot be said to have returned to normal conditions until that movement has ceased. It means an adjustment of values in the branches affected, which from the present outlook will come gradually, and may occupy some time, although the extent of the necessary decline is not great, even if foreign prices fall off in sympathy. It is doubtful whether foreign foundry iron, if sold at cost, could be laid down at our coast ports at much less than $15.50 for No. 3, or that steel billets, taking export bounties into account, could be offered at less than $25. On finished materials the margin has been narrow, below official prices, so that the quantities imported have been relatively small.

It is a somewhat difficult matter to figure closely how much tonnage the import movement really represents, calculated on pig iron as a basis. The returns of the Bureau of Statistics do not give the quantities for some important branches, like structural material. However, if our consumption in 1903 is to be what it was in 1902 it may be estimated that we must increase our make by 1,000,000 tons, as representing this year's imports. We shall certainly have the necessary plant to do it by the spring of the current year. We expect to have the materials and hope to have the facilities for transporting and handling them. But it is only fair to admit that until the spring we shall probably not be able to make much headway.

A problem which is troubling some observers is whether consumption will suffer from the higher range of prices. Ample evidence is at hand to prove that consumption will be large in the finished products in which the leading interests have kept values steady. This is notably the case in structural material and plates, and to a certain degree in steel rails. Nor is the consumption in bars, sheets and wire likely to allow values to reach a level so high as to cut off requirements, even if the leading interests were inclined to permit it. There may be more doubt in the foundry trade, because consumers are only now likely to feel more seriously the effect of a virtual doubling in price. The majority of founders have been melting comparatively cheap iron supplied on old contracts. So far as indications go now the danger of a restriction of consumption seems remote, but it is well to remember that a change in conditions may develop quite rapidly. We have, of course, a good deal of latitude to compensate for a decline in the consumption by the cutting off of importations by bringing values down to a level which is not likely to cause the shutting down of any important domestic plants.

The outlook for a continuance of a very large consumption is distinctly good, since the general financial and industrial conditions seem sound. That the requirements of the railroads will continue on an enormous scale is practically certain. The orders in hand now for locomotives, steel cars, rails and bridge materials are very large, and nothing but a financial upheaval can stop them from being called for.

While there has been a considerable amount of real estate speculation, usually recognized as the phenomenon accompanying a waning boom, it does not appear to have been on a dangerous scale. Building has been very active in all parts of the country, and seems likely to continue, in spite of the fact that cost has risen considerably. The building of new manufacturing plants has gone apace, and there has been an enormous amount of remodeling and reconstruction. The electrical industries have been exceedingly busy, and as yet show no indication of relaxation. Municipalities, generally, are not making very extensive plans for improvements, but a good many smaller cities are developing a water supply. There has been intense activity in mining, and while there are few indications of general speculation a good deal of money is going into the various branches of the industry in different parts of the country. The shipbuilders of the lakes have assurances of an active year, while the promise for the plants on the Atlantic Coast is less flattering.

Our exports of manufactures of iron and steel have kept up remarkably well, in spite of adverse conditions. The figures of the Bureau of Statistics for the first 11 months of the years 1900, 1901 and 1902 show a decline from $119,604,848 to $94,112,782 and to $90,136,024. The higher grades of manufactured product have not alone generally held their own, but there has

been a distinct gain in a number of important lines. This may be interpreted as proving that higher cost of raw material is not so serious, but it is an open question whether the rise in wages latterly may not be a more potent factor in cutting off exports of highly finished goods.

Until the usual time of anxiety for the crops arrives the business of the country therefore has a very cheerful outlook.

Many manufacturers, however, are facing a serious problem in the very marked advance in their costs of production and of their cost of the delivery of goods to their markets. The general advance in railroad freights tells both upon the assembling of materials and upon the marketing of product. The rise in wages has been so general that its cumulative effect is pronounced. The day of readjustment must come, and there is always the possibility that it may be closer than is generally suspected. We have put an enormous amount of money into brick and mortar, machinery and equipment which cannot be expected to turn in earnings at once. The greater part of the permanent improvements carried out was probably wisely made, and they are needed for our rapidly growing country. But we shall need a period of rest before long, since with all its enormous wealth producing powers our country cannot go on putting earnings into new instruments of production at the same rate.

Restriction of Output in the United States.

Whether the reports made by the workingmen brought to this country on a tour of inspection by Alfred Mosely are perfectly sincere, or are colored by a desire to say what the labor leaders and union partisans of the British industries will find it most agreeable to hear, is, of course, a matter of opinion. They are beginning to talk for publication, and what they are saying suggests the kind of verdict sometimes given by juries and set aside by the court as contrary to the weight of evidence. On the whole, the visiting workmen seem to be desirous of conveying the impression that "Great Britain's commercial supremacy cannot be undermined by anything existing or likely to develop in the way of American competition." This is agreeable reading, no doubt, and is the kind of report which might be expected from men so thoroughly impressed with the excellence of everything British that they cannot see that the "commercial supremacy of Great Britain" is already a tradition, and that from one cause or another that nation is steadily falling behind in the competition for trade, in some lines actually, as measured by a steady shrinkage of exports, and in other lines relatively, owing to the much more rapid development of other countries. A majority of Mr. Mosely's party concede that the American workman is a more efficient instrument of production than his British *confrère*, but they are firmly impressed with the belief that the pace he has set for himself is one which cannot last. One of them soars into the blue empyrean of sociology and discovers as the result of reflection on what he saw here that "American industrial progress is chiefly notable as breeding millionaires and men out of work." This is an ingenious but not very profound generalization. In point of fact, our industrial system is doing nothing of the sort. Millionaires are not as numerous in this country as might appear from a superficial glance. A good many of them belong to the class of rich men described in the letters of John Graham of the Chicago stock yards to his son, as "one of that brand which foots up a million in the newspapers and leaves the heirs in debt to the lawyers who settle the estate." However, there are a good many rich men in England, and droves of the unemployed just now, and what part of the British industrial system has brought about this condition we are not prepared to say. By and large, the English people are finding a good deal of comfort in the reports of the Mosely visitors. It seems evident that, while there is something to be learned from American methods, there is no ground for discouragement and still less for dismay. This is gratifying. John Bull standing up with his coat off and his fists clenched is, on the whole, a more agreeable spectacle than John Bull lying down with all the fight knocked out of him and whining over his hard luck.

There is reason to believe that the Mosely party are quite sincere in what they are saying, as the greater part of the information they absorbed and assimilated came to them from the labor leaders, who are trying to bring about in this country the conditions existing in England, and confidently expect to be able to do so. The kind of restriction of output which results from secret agreements among workmen to limit production does not yet obtain in this country to anything like the extent to which it obtains in Great Britain, but the eight-hour movement and the rules of many trades fixing the productiveness of labor and penalizing individual industry reveal a tendency which the labor leaders hope and expect to erect into a national habit, and have impressed their confidence upon the English visitors. That they have not succeeded as yet in establishing "ca' canny" as the recognized rule in any considerable number of American workshops does not discourage them. They expect to succeed, and may do so if a reaction from great industrial activity does not so restrict the demand for labor that the man with a "job" will give more consideration to keeping it than to trying how near he can come to losing it without quite reaching the stage of the blue ticket. Another obstacle to the success of this movement is that the American workman finds himself in a constantly changing environment, and scarcely gets adapted to one set of conditions before a new mechanical development so changes everything as to set him "guessing" how he shall retain for his skill and experience in doing things in old ways any of the value which attaches to them in the more conservative system of the English shops. He is too wise to attempt anything like systematic and organized opposition to labor saving machinery. He recognizes that machinery is a necessity of modern industry, and has observed that in some mysterious way it increases the demand for labor to a far greater extent than it displaces it. Probably his acquiescence is due less to an intelligent perception of the advantages of machinery than to the fact that he is dazed by the rapidity of mechanical progress and does not have time to remain long enough in one set of conditions to feel that he is a part of them, and that to change them is equivalent to his effacement as a factor in the industrial equation. However, those who are in touch with the aims and tendencies of the labor organizations, especially those which claim to be national in their scope and field, are aware of an effort ceaselessly exerted to restrict production in every way possible, under a mistaken notion that the altruistic purpose of the trade union will be furthered by making the unit of output per man so small that the number of men required in the industries shall be as large as possible. There is a theory in this. Naturally, the strength of the unions is found in the fidelity of the least skillful and most dependent of the wage earners. If not taken care of they become strike breakers; and to take care of them it is

necessary that the pace shall not exceed that which it suits them to maintain.

Specific instances of systematic restriction which cannot be proved and in many instances are not suspected come to light from time to time and are extremely instructive. A correspondent of the London *Times* who accompanied the Mosely party to this country gives one of these as of recent occurrence in one of the factories he visited. In the polishing room of a union shop the men were employed on piece work and the maximum earning of any polisher was $4 per day. A demand for higher piece rate having been refused, the men struck and their places were promptly filled with such men as could be picked up, some of whom had never worked at polishing and knew nothing about it. For these beginners the piece rate was reduced 25 per cent., but in a short time these new men were earning an average of $9 per day. The obvious conclusion from this was that the piece rate was still too high, considering the amount of skill demanded by the work, and it was reduced 50 per cent., making the maximum wage $4.50 per day. The net result was that with a working force reduced 30 per cent. and an increase of 10 per cent. in the total pay roll, they had increased the output of the polishing shop 60 per cent. as compared with that made before the strike. This result was possible with nonunion labor, but it would not have been possible with union labor. The question whether the employers were justified in reducing the piece rate first 25 per cent. and then 50 per cent. depends for its satisfactory answer upon whether the rate per piece paid before the strike was one which the profits of the business warranted. If so, it would have paid much better to leave it at the figure at which the men earned $9 per day. It is to avoid exactly such reductions that the unions discourage industry and zeal. As an object lesson it would have been worth more than the amount saved by the second reduction.

"Jim" Fisk, one of the most picturesque characters in the history of American finance, used to tell a story of an incident which happened to him in his boyhood which taught him a life remembered lesson. One day his father took him to the stable and asked him if he could clean it out. Jim was not sure. It was a considerable undertaking for a small boy, but the old man promised him 50 cents if he would do it. The lad was tempted and essayed the task. The window through which he had to pass the bedding and sweepings was 2 feet too high for him, but with the aid of a box he reached it, and after some hours of back breaking work he completed the task and claimed the reward. His father gave him the half dollar, patted him on the head and told him that since he had done it so well he might thereafter do it every morning. Fisk realized that he had sold his infant strength very cheap and the memory of that half dollar governed his whole future life.

For limitations of output due to the fact that an increase of earnings under a perfectly satisfactory piece rate would be followed by a cut in the rate, and that all the wage earner would gain therefrom would be harder work for the same or possibly less wages, the employer is to blame. The London *Times* correspondent shrewdly observes:

"Some employers appear to cherish the notion that such and such a sum is as much as it is good for a particular workman to have; and if they find him earning more they at once jump to the conclusion that he is being overpaid, without stopping to consider whether or not the amount is justified by his industry or skill. In some cases it is a legitimate inference that the original standard of payment is too high; but that inference may be pushed too far, and sometimes the conclusion should be that the man has increased in productiveness and deserves greater remuneration. Much of the trouble experienced in the introduction of labor saving machinery has, I fancy, arisen from employers wanting all the increased profits gained thereby and expecting their workmen to become more useful and more productive parts of the industrial organism without receiving more money. It is only human nature for a workman to look for a part of the gain made through his agency and if it is not given him openly, to try to get it by indirect means."

There is food for thought in this suggestion. In the greatest industrial organization in this country the rule obtains in theory, and to a great extent in practice, that labor cost is a negligible factor. If output is such as to reduce the interest charge on the capital investment per unit of product to a satisfactory figure, labor is welcome to earn all it can, and the more it earns the greater the satisfaction of the employers, since large earnings mean large profits. As the rule the greatest mistake which can be made in business management is to play upon labor the trick of which Fisk was the victim. It never pays in the end, and what is immediately saved in manufacturing cost is usually wasted a great many times over in one or another form of contention with labor.

The Passing of a Memorable Year.

The year 1902 has made for itself a distinctive record. It was a period of remarkable achievements in the business history of the United States. While other countries were suffering from stagnation in their industries, which was especially acute in Germany, the manufacturing interests of this country were never so active. For a few years prosperity has been world wide and all the great manufacturing nations had found their resources taxed to the utmost to meet the apparently ever growing demand. But with the outside world the meridian of their prosperity was reached in 1900 and since that time they have been tasting some of the bitter fruit of adversity. The closing months of 1902 found many works closed in European countries and a large and growing army of unemployed workingmen. The contrast presented by the United States is very great. The impetus of the revival of prosperity which began in 1898, instead of losing its force with the declining tendency in other countries, gained in strength and became even more pronounced in 1902. The volume of business not only surpassed all precedents, but grew too great for the facilities of production and distribution.

The history of the world can be scoured in vain to find a parallel with the condition of affairs in the United States in 1902. At no time since the advent of steam as a motive power in transportation have the facilities for the distribution of commodities been so completely overwhelmed by the vast offerings of all classes of merchandise as within the past few months. The greatest railroad systems of the country, whose capabilities had always previously been rated far in excess of any demands, fell as seriously short of serving the manufacturing and commercial interests dependent upon them as the lines less ably managed and admittedly poorly equipped. Manufacturers turned out greater outputs than ever before, but could have done still better by considerable if they had not been hampered by the difficulty of securing raw materials on the one hand, particularly coke, and the frequent inability to make shipments of their products on the other. A specially re-

markable feature of this experience is that it came not after a period of pinching economy by the railroads, in which their equipment had suffered, but after several years of heavy earnings and unprecedented expenditures for rolling stock of greater capacity as well as for other facilities. In no previous year had the railroad companies been such heavy purchasers of all classes of supplies as in 1902, their urgent demand crowding manufacturing establishments to the utmost.

The natural increase in the business of the country, due to the growth of population and the great purchasing power of a people whose average earnings were far more than sufficient to cover the necessities of life, would in itself have been enough to keep the iron trade well employed. But the extraordinary and insatiable demands of the railroads undoubtedly brought about the marvelous growth in consumption of iron and steel which outran the huge productive capacity of this country. The revolution in the currents of trade, changing the United States from an exporter of pig iron, steel billets, steel rails and structural steel to an importer of all these commodities, was one of the notable features of 1902. When the figures are made up for the year it will be found in all probability that our importations of these products alone will aggregate over 1,000,000 tons. Such a volume of iron and steel imports has not been known since the famous boom period of 1879-80. It was an amazing experience, in view of the fact that only two years since we were exporting in the same lines on an even larger scale and the belief was strongly grounded that our position in that respect had been permanently established. Added to this is the further fact that our production of iron and steel last year was more than 10 per cent. greater than that of the preceding year, which had beaten all records. It is estimated that the production of pig iron in the United States in 1902 was over 17,600,000 gross tons, and of all kinds of unwrought steel over 15,000,000 tons. Yet these enormous quantities were inadequate to our needs. The foundries and steel works were compelled to seek additional supplies of pig iron abroad, the rolling mills were obliged to import steel billets and consumers who urgently needed finished iron and steel products of various kinds found foreign mills their surest source of prompt supplies.

While the iron trade itself was free from extensive labor troubles during the year, it was a sufferer from the strikes of coal miners. The most important of these was the anthracite coal miners' strike in Pennsylvania, which began in May and lasted almost five months, cutting off the supply of anthracite coal, on which some of the Eastern furnaces depend, and reducing the output of pig iron about 1000 tons per day during that period. The strike of bituminous coal miners in West Virginia was not nearly so long, but while it lasted it cut off a considerable production of coke, which interfered with the operations of a number of furnaces in the Central West. Another strike of bituminous coal miners in Alabama, which was of short duration, caused some furnaces in the South to suspend operations for lack of coke and thus slightly reduced the output of pig iron in that section. But even if all these furnace suspensions had not occurred, the production of pig iron would not have been large enough to avoid the necessity of importations.

Another noteworthy characteristic of the year was the absence of the wild inflation of prices heretofore the invariable accompaniment of an excessive demand for iron and steel. Much the greater part of the tonnage produced was sold at reasonable prices. The thanks of consumers are largely due to the United States Steel Corporation for establishing and maintaining such a policy, which imparted the desirable quality of stability to the trade of the year. Other large manufacturers gave willing support to this policy, but it could not have been maintained without the powerful backing of the United States Steel Corporation. At times during the year the demand for some finished products was so much in excess of the supply that independent manufacturers were able to secure good premiums for early shipments, but the tonnage thus involved was not great as compared with that sold at the lower established prices. Pig iron and steel billets, being less under the control of the large manufacturers, showed a more general tendency toward high prices, but by no means approached the values realized in previous periods of excited demand. It was most remarkable that in such a year as this any recessions in price should have occurred, but, owing to the great increase in independent mills making light sheets, tin plates, wire products and merchant pipe, the capacity for production in these lines so greatly exceeded the demand, large as it was, that a sharp reduction was made in the fall months. The situation as to wire products, tin plates and merchant pipe was subsequently greatly changed by the absorption of the Union and Sharon Steel companies by the United States Steel Corporation.

Few years have exceeded 1902 in the expansion of productive capacity. A great deal of work was done in the erection of blast furnaces, steel plants and finishing mills, some of which reached the producing stage, but much more runs into the coming year. The effect of the increased capacity has already been felt in certain products, as previously noted. In due time it will make itself felt in other lines. Meanwhile the sustained extraordinary demand from the railroads and the generally favorable condition of other consuming interests promise another year of very large consumption of iron and steel.

Our Imports and Exports of Iron and Steel.

The Bureau of Statistics has just published the figures of the imports and exports of iron and steel for the first 11 months of the year. Turning first to the imports, we have the following data for the years 1901 and 1902, to which we have added the November imports, as best indicating the rate at which we have lately taken foreign materials:

Imports of Iron and Steel, 11 Months.—Gross Tons.

	11 months, 1901.	11 months, 1902.	November, 1902.
Iron ore	887,337	1,063,025	65,494
Pig iron	53,289	507,010	100,406
Scrap	19,039	97,361	10,502
Bar iron	19,212	26,444	2,478
Steel rails	1,488	57,495	8,107
Billets, blooms and bars	7,126	249,695	27,686
Hoops and bands	2,970	3,232	39
Sheets, plates and taggers	4,998	6,135	971
Tin plate	67,102	53,656	4,086
Wire rods	15,306	18,606	1,915
Wire	3,852	3,170	371
Total value all imports iron and steel exclusive of ore	$18,267,862	$36,766,961	$4,779,093

A number of points deserve consideration. To begin with, the Bureau of Statistics does not give tonnage figures on some important items, notably on the imports of structural material. Furthermore, there is not aggregated that tonnage which is imported under the drawback system. This is very important in the case of tin plates and is of some consequence in the case of

steel billets, wire rods, old material and pig iron. Then, as will be observed, the imports have been normal, or nearly so, in certain lines, notably bar iron, much of which is of special grade, hoops and bands, sheets and wire. The really exceptional imports are confined to pig iron, which may reach 600,000 tons for the year, billets and steel bars, which may come up to 275,000 tons, and steel rails, which may attain 65,000 tons. It is safe to say, therefore, that figured back to pig iron, we imported this year about 1,000,000 tons more than in normal years.

Our exports of iron and steel show some surprises. The total value of the articles classified by the Bureau of Statistics under iron and steel and its manufactures, exclusive of ore, amounted to $90,136,024 during the first 11 months of 1902, as compared with $94,112,782 during the corresponding period of 1901, and $119,604,848 during the first 11 months of 1900. Since the November exports of 1902 were $8,119,274, against $8,201,008 in 1901, we seem to be keeping up our rate of exports very well. The following tables, which give the tonnage figures where they are available, show the movement during the last three years:

Exports of Iron and Steel, 11 Months.—Gross Tons.

	1900.	1901.	1902.
Iron ore	51,383	64,558	87,210
Pig iron	257,169	75,843	26,277
Scrap	47,177	13,598	9,040
Bar iron	10,180	17,586	19,200
Wire rods	9,497	7,650	21,208
All other rods	73,044	24,631	8,915
Billets	94,717	27,286	2,409
Hoops and bands	2,819	1,149	1,546
Iron rails	5,319	901	210
Steel rails	341,016	302,232	66,854
Iron sheets	8,578	6,418	3,236
Steel sheets	37,656	22,533	12,984
Tin plates	138	429	1,531
Structural iron and steel	63,695	49,089	51,776
Wire	71,083	79,319	91,584
Cut nails	10,112	8,734	6,742
Wire nails	25,664	17,140	24,591
Other nails and tacks	1,687	1,707	1,896

Some of the surprising features of this table are that the exports have kept up so well, considering the adverse circumstances. While not relatively important, it is curious that the exports of wire, of structural material and of steel rails have been as large as shown by these figures.

For those manufactures of iron and steel for which values only are given we have the following figures:

Exports of Iron and Steel, 11 Months.

Locks and hinges and builders' hardware	$5,549,091	$4,726,292	$6,370,505
Saws	284,836	297,823	305,157
Tools	3,121,929	3,006,509	3,620,290
Car wheels	154,477	174,120	136,268
Castings	1,406,026	1,074,320	1,528,834
Cutlery	246,798	217,582	251,802
Firearms	1,331,838	781,761	902,986
Cash registers	752,959	864,544	1,097,843
Electrical machinery	4,957,308	5,264,962	5,508,112
Laundry machinery	442,399	476,748	470,194
Metal working machinery	5,855,178	2,678,510	2,595,227
Printing machinery	1,137,279	682,237	730,402
Pumping machinery	2,572,579	1,837,388	2,251,886
Sewing machines	4,173,955	3,472,676	4,196,161
Shoe machinery	952,045	961,292	706,354
Locomotives	4,059,912	3,862,018	3,784,436
Stationary engines	761,909	769,683	627,376
Boilers and parts of engines	1,751,391	1,345,987	2,229,937
Typewriters	2,504,388	2,651,757	3,248,433
All other machinery	21,884,195	17,059,489	19,273,918
Pipes and fittings	5,526,100	4,594,477	4,636,758
Safes	115,591	111,860	563,753
Scales and balances	494,311	477,936	455,821
Stoves and ranges	512,400	582,994	800,686
All other manufactures of iron and steel	15,199,675	13,924,440	9,377,548

On the whole this exhibit is very gratifying, since the exports have kept up remarkably, with few exceptions, and in a number of instances actually show an increase over the banner year, 1900.

Friedrick O. Wannieck of Bruenn, Germany, has contributed to the proceedings of the German Society of Engineers a very thoughtful report on American shop practice in the machinery industry, which is the result of a visit to this country.

The Lake Superior Iron Ore Trade in 1902.

BY DWIGHT E. WOODBRIDGE, DULUTH.

Were the iron ore shipped last year from the famous mines of Lake Superior to be piled in one mound it would make a block nearly 20 miles long, 100 feet wide and 33½ feet high. All this enormous mass was put through the various processes of mining, hoisting to surface, transporting to Lake Superior, was carried down the lakes from 500 to 1000 miles, and then either at once moved forward to furnaces or stored to await final removal in the last stage of its journey as raw mineral. The mere handling of such an enormous mass of material, even when carried along with the utmost refinements of automatic machines, is a matter of such magnitude and is attended by so many intricacies of detail that it can be fully appreciated by those only that have much to do with it.

The carriage of iron ore out of Lake Superior alone forms about 66 per cent. of the traffic both into and out of the lake, of such preponderating influence is the ore trade. Out of 36,000,000 net tons of freight passing in 1902 through the canals at the foot of Lake Superior 24,000,000 tons were ore. To this must be added the 5,400,000 tons more carried from the port of Escanaba on northern Lake Michigan.

Not only is the ore traffic of the upper lake region increasing thus wonderfully year by year, as the table below will indicate, but the importance of individual mines has more than kept pace. Nine years ago, out of 79 mines in operation there were but six that reached the then vast production of 300,000 tons. This year as many have made a product for the season of more than 1,000,000 tons each. Then the 79 operating mines averaged about 77,000 tons. Now the 120 operating properties average 230,000 tons. As many of these mines were then in operation, and as some have been continuously worked for 30 to 40 years, the average increase is a matter of the highest importance. Not only this, but its bearing on the future of the mining industry is of the highest moment.

The past year six Lake Superior mines were in the "million ton" class, one of them closely approaching 2,000,000 tons. This was the Fayal of the Mesaba range, a mine whose first development was in the winter of 1894-1895, and that has shipped since then the splendid total of 7,500,000 tons. Its reserves are such as to permit a similar or even larger shipment for many years, and it is opened for enormous annual production. Its shipment for the past year was 1,919,173 gross tons. Following it was the Stevenson, a mine whose first ore was sent down in the fall of 1900, and whose development has practically been crowded into two seasons. The record made by this property has never been approached in the history of mining. But for the fact that it is steam shovel property and a large and easily opened deposit it could never have done what it has, even with the utmost exertion. Other million-ton mines this year have been the Adams, an underground property, the Mountain and Mahoning, both steam shovel operations, and the Norrie-Pabst, the chief underground mine of the Gogebic range. Had it been considered advisable other mines might have been put in this class, notably the Chapin, whose product closely approaches seven figures. The mere mention of these large figures indicates nothing of the skill and work required for such a result. It is only by the exercise of a high degree of ability all along the line, from the mine to lower lake receiving docks, that such outputs are possible, and it is to the great credit of all connected with the work whether in mining or transportation that the work has been done.

Statistics of Shipments.

Since the beginning of mining operations in this region, when in 1855 the old Jackson sent down its first important shipment of ore to bloomeries, there have been taken from the hills and swamps of the lake region 220,000,000 tons of ore. More than half of this has been in the past six years. In 1902 twice as much ore has been

marketed as in 1898, four times as much as in 1894, eight times as much as in 1886, and 16 times as much as in 1882. In 1864 the total product was but one-hundredth part that of to-day. These figures serve to emphasize the manner in which the iron industry has quickened its pace. By decades the following figures will be instructive:

	Gross tons.
Decennial period ending with 1859	203,600
" " " " 1869	2,894,000
" " " " 1879	10,165,000
" " " " 1889	34,753,000
" " " " 1899	104,066,000
Three subsequent years, 1900-1902	67,650,000

Should the remaining years of the present decade show no increase over the season now passed, the ten-year total would be 266,000,000 tons. That it will be far more than this no man can doubt. That it will increase proportionately with preceding years no one can expect, but that the production of, say, 1910, may be as much as 45,000,000 tons, with a total for the ten years of 300,000,000 tons, is a proposition that no man, in the light of the past, can afford to consider ridiculous.

Shipments of the past year from the various upper lake ports, and by rail, as compared with late preceding years, have been as follows:

Ports.	1899. Gross tons.	1900. Gross tons.	1901. Gross tons.	1902. Gross tons.
Duluth	3,509,965	3,888,986	3,437,955	5,598,408
Two Harbors	3,973,733	4,007,294	5,018,197	5,605,185
Superior	878,942	1,522,899	2,321,077	4,180,568
Escanaba	3,720,218	3,436,734	4,022,668	5,413,704
Gladstone	381,457	418,854	117,089	92,375
Ashland	2,703,447	2,633,687	2,886,252	3,553,919
Marquette	2,733,596	2,661,861	2,354,284	2,595,010
Michipicoten	.....	62,000	300,000	298,420
All rail	350,446	489,078	431,715	475,000
Totals	18,251,840	19,121,393	20,889,237	27,812,589

Of course, there has been no such increase in consumption of iron ore this year as these figures would seem to indicate. In other words, the amount on hand now is far more than sufficient to carry the furnaces to the beginning of the coming navigation season. The United States Steel Corporation alone have ore on hand at lower lake docks and furnaces to maintain their production at the probable rate until July or August, and other consumers are nearly as well provided.

New Ore Discoveries.

While exceedingly hard to estimate accurately the amount of ore discovered during the past year, it is safe to put it at not less than 75,000,000 tons. Practically all of this has been brought to light upon the Mesaba range, the most prolific ore carrying formation yet found in the world's history. Most of what has been opened on the Mesaba has been in the district immediately around Hibbing, though careful and consistent work elsewhere is disclosing considerable bodies of ore. On the older ranges finds of new ore have been extremely few and far apart. All the costly exploration done in the past five years upon the Menominee range, whose wide ore-bearing formation gave promise of splendid reward, has brought out but a mine or two, though to be sure old finds have been materially extended and added to. On the Marquette range the new Negaunee area is practically the only field found for years, and there very large properties may be opened in due time. Not a single ore area has been found on the Vermillion range since 1886, though the money spent in exploration has been vast. New mines have been opened there, as on other ranges, but they have been on extensions of old and well known zones of ore. The same is practically true of the Gogebic. On the Mesaba, on the contrary, explorers are continually finding new mines, many of them in spots where preceding explorations did not result.

Perhaps 25 per cent. of the ore bearing formation on what is now recognized as the economically valuable portion of the Mesaba has been found to carry ore in quantity sufficient to form mines, and that the limit of work has been nearly reached is evident from the great amount of exploring now going on and the meager results therefrom. A year ago it appeared as though the range was pretty closely explored, but since then work has been far more active and at many times the cost, while the results of 1902 are less than in the year previous. That many mines will yet be found upon the Mesaba range there is no reason to doubt, but it will be at added cost and after more failures than have been the experience of most prospecting companies. But this year probably the most active concern in exploration for new ore has been one of the so-called independent steel making companies. The net result of the explorations of 18 tracts of land, all selected with care by experts, has been one mine of about 7,000,000 tons. The remaining 17 explorations have been blanks. This experience is about as unusual as that of a certain local syndicate that has found a mine of considerable importance on more than half the explorations it has undertaken.

Merchantable Iron Ore.

A natural result of the great increase in the demand for ores of this region has been the lowering of the percentage of iron considered necessary in order that the ore shall be called merchantable. "Merchantable iron ore" was one thing during the years of depression following the panic of ten years ago; it is quite another thing to-day. Two years ago no Mesaba ore that assayed under 60 per cent. was considered fit to sell, and in mining explorations no account was made of the vast tonnage often found running from 50 to 60 per cent. All this is changed. Millions of tons of ore running down to 55 per cent. have been shipped from that range this year, together with large quantities from other ranges that assay not more than 40 to 45 per cent. in iron.

There are hundreds of millions of tons of these ores in the lake region that have not been looked upon as an asset realizable for many years that will now come into consumption, not alone, and perhaps not chiefly, from the probable some time exhaustion of rich ores, but on account of certain economies introduced by reason of and resulting directly from, the centralization and concentration of mining and transportation interests. So great has been the saving by recent action on the part of the United States Steel Corporation and others, that ores can be utilized now whose use a few years ago would have bankrupted the consumer.

Large quantities of low grades are now mixed with richer ores at the mines and shipped East. It is found that it is more economical to mine these ores as they come, shipping the entire product, than to attempt to sort grades and leave the lean ores behind. The increase in available tonnage made this year from this source is several times as much as that resulting from exploration for new bodies, but in estimates of tonnages in sight this fact is generally lost sight of.

What there may be "in sight" in the Lake Superior region is a delicate question. The estimates of the United States Geological Survey, giving 500,000,000 tons for the Mesaba and half as much for all other ranges combined, is well known to be far too low. In one 6-mile stretch of the Mesaba range there is half as much. Many a mine that years ago was looked upon as near its end, as practically exhausted, is now a bigger property than ever, a larger annual producer and with more ore in reserve than at any time in its history. This has so often been the fact that, except in especially simple formations, it is a daring thing to predict the end of an ore body.

Changes in Ownership.

Notable changes have taken place the past year in ownership of ore lands and mines. The most startling of these have come at the close of the year, and indicate to what degree the largest interests are fortifying themselves for long into the future. The United States Steel Corporation have not done a bigger thing for themselves and their market value than to close recent deals for ore lands and mines. They have within a month closed several very large transactions besides innumerable smaller ones, the extent of which no one outside the corporation's inner circles realizes or appreciates. They are more active now in gathering in ore reserves than at any time since their formation. They appreciate that absolute dictation in the iron trade lies not so much in fur-

naces and mills as in the control of sources of supply for minerals, raw material that does not grow and cannot be made.

Outside of a comparatively few minor holdings, some of which may at any time become portion of a great aggregation, the ore reserves of the Lake Superior region are in less than ten hands, of which the United States Steel Corporation are so overwhelmingly in the lead that all others are dwarfed in comparison. In their chosen field of the Marquette range the Cleveland Cliffs Iron Company are well toward the front and have been adding to their holdings with the same keenness that the greater concern have shown elsewhere. Around Crystal Falls a Cleveland mining firm is predominating just now, and Pittsburgh and Buffalo iron makers are very considerable holders on the Menominee, Marquette and Mesaba ranges. So sharp has been the competition for mines and so anxious have been various steel makers to secure ore reserves against the time when they will be unable to buy much ore in open market, that ore properties are sold as soon as put on the market and at prices that appear extreme in comparison with those of a few years ago. But however inflated prices may now appear they are probably low in comparison with what will be offered when the policy of no sales is inaugurated by big consuming miners.

That this policy will be put into effect very shortly there is no reason to question, nor is there the slightest doubt that it is to-day virtually the ruling idea, and would be definitely enforced but for the policy of the largest mining company to maintain as low prices as may be consistent with conditions and as slight fluctuations as possible. Such a policy is natural and is entirely defensible. Indeed it is the only policy to be pursued when the proper time arrives.

The United States Steel Corporation have the past year mined from their own workings and carried to lower lake ports on their own or chartered ships more than 16,000,000 gross tons of iron ore. Their own Minnesota railroads have hauled to Lake Superior nearly 12,000,000 tons of this quantity, and their own ships have moved 9,500,000 tons of it. The magnitude of these operations, carried on under a single control and by a single head leadership, is such that all economies in mining and transportation are exceeded and a wonderful record has been made. Money has been saved by this work in amounts that would be large dividends for great concerns.

The Future Price of Ore.

It is now generally conceded that the price at which Lake Superior ores have been sold is lower than it will be in the future. Refusal to sell on the open market and the absorption of reserves by large interests, restricting markedly the supply for general sale, is forcing this step, and it takes no prophet to foretell the change. Mesaba ores, that have been held at unfairly large differentials as compared with the old range product, will rise to their reasonable level, and all ores of a desirable character will move upward. The day of cheap pig iron is probably over, so far as any lengthy period is concerned. High grade Bessemers and ores of most desirable physical characters will rise more notably than others, and the general upward trend of price will bring into the market ores that are now considered unavailable. The supply of lean Bessemers, siliceous ores, low in iron, magnetites and limonites, as well as of ores that contain elements now considered detelerious and unfavorable for furnace use, is enormous. No estimates can be made of what tonnage of these classes of ores may be found around Lake Superior when the time comes for their use. Methods of treating ores that contain elements that now bar them from consumption will undoubtedly be found by the chemists when their use is necessary to the maintenance of production. It is generally conceded by men in the ore trade that there may be as large quantities of these unconsidered ores as have yet been found of the better grades. Every district around the lake has them in apparent abundance.

Prospects for 1903.

It is not to be supposed that next year's mining will increase in the ratio of 1902, or that the shipment of the coming season will be very much in excess of that now past. The maintenance of present reserves, together with the movement of what ore may be required for furnaces in the 12 months, is looked upon as about the programme. Stocks on Lake Erie docks are now 1,200,000 tons more than a year ago, and furnace yards are full of ore. The same conditions prevail at Chicago and other lower points.

MANUFACTURING.

Iron and Steel.

The McInnes Steel Company, Limited, Corry, Pa., will build an addition to their plant as soon as the weather will permit and the necessary arrangements can be made. The company are so crowded with orders for their self hardening and hammered tool steel that they have been compelled to put on a night force to get out the work.

The idle industrial plants at New Castle, Pa., are gradually being started. On Monday, December 29, 20 of the 30 hot mills of the Shenango works of the American Tin Plate Company, at New Castle, were started up. On Monday, January 5, it is expected that the Greer works of the American Tin Plate Company, at New Castle, will be started. This plant contains 20 pair and sheet furnaces, 7 annealing furnaces, 20 hot and 21 cold mills. The Shenango Valley works of the National Steel Company, at New Castle, which were closed for about a week for repairs and inventory, have again resumed operations.

The furnace of the Woodstock Iron Works, Anniston, Ala., which has been rebuilt, was blown in about two weeks ago. The furnace is equipped with the most modern machinery, including a Kennedy skip hoist and double bell top filler.

The Northwestern Steel Company, Seattle, Wash., who are erecting a rolling mill in that city, have incorporated with a capital stock of $150,000.

Haselton Furnace of the Republic Iron & Steel Company, at Youngstown, Ohio, which has been idle for some time, will soon resume operations, shipments of coke now coming forward regularly. The Andrews Works of the company, at Youngstown, will resume operations very soon after January 1, after a shut down of some months. This plant has been considerably improved and put in first-class condition.

The report that the interests of Follansbee Brothers Company of Pittsburgh, manufacturers and dealers in tin plate and metals, had been acquired by the United States Steel Corporation is officially denied. Their new plant, now being erected at Follansbee, near Wheeling, W. Va., is progressing rapidly. It will contain four sheet and four tin mills.

The United States works of the American Tin Plate Company, at Demler, near Pittsburgh, have resumed operations after an idleness of some months.

Atlantic Furnace of the Republic Iron & Steel Company, at New Castle, Pa., has started up again after being shut down for some time for want of coke.

The American Steel & Wire Company are gradually dismantling their New Castle works, at New Castle, Pa. This plant formerly contained wire mill and 254 wire nail machines, but many of the machines have been removed to the works at Granite City, Ill. It is expected that eventually all the equipment will be removed to other plants.

General Machinery.

The Phœnix Iron Works Company, Meadville, Pa., manufacturers of the Dick and Church automatic cut off engines, boilers and heaters, will start work on a new foundry building as soon as spring opens, making it 50 x 200 feet, with overhead cranes, &c. They also contemplate some changes and additions to their machine shop next year.

The Boston & Albany division of the New York Central Railroad system is to build a large machine shop in its yards at Worcester, Mass.

The Warren Steam Pump Company of Warren, Mass., had their annual meeting last week, when the stockholders voted to increase the capital stock from $100,000 to $200,000. Frank Slater, president of the Slater Engine Company, resigned from the board. Frank F. Phinney of Boston was elected general manager and will enter upon his new duties immediately. The officers elected are: President, Wilson H. Fairbank; treasurer, Edward Fairbank; clerk, Frederick C. Barlow; directors: Wilson H. Fairbank, Edward Fairbank, John G. Leach and Louis A. Gendron, all of Warren; George W. Wells of Southbridge, Mass.; Charles E. Brown of Springfield, Mass., and Frank F. Phinney of Boston. The report that the company are to build a large foundry is denied.

The Union Abattoir Company of Baltimore, Md., are making large additions to the electrical equipment used for power distribution in their plant. A 200-kw., 7200 alternations, two-phase, engine type generator, with exciter, and two 40 horsepower, type "C," motors have recently been purchased through Dr. W. A. Drysdale, constructing engineer, of Philadelphia, from

the Westinghouse Electric & Mfg. Company. This machine is to be installed as an addition to the present plant, which consists of a 150-kw. engine type generator and about 20 induction motors, ranging in size from 3 to 40 horse-power inclusive. The Westinghouse Company have also sold a number of direct current 220-volt motors to the York Mfg. Company of York, Pa.

The Betts Machine Company, Wilmington, Del., have increased their capital stock to $600,000 in order to take care of the many extensions they have made in the past two or three years and those now in progress.

The organization of the Coshocton Machine & Mfg. Company, Coshocton, Ohio, has been effected with the following directors: Geo. A. Siegrist, P. J. Haidet, Andrew Weisner, J. C. F. Hutton and R. A. Powelson. The company will erect a new factory for the manufacture of dies, presses and special machinery.

Bliss & Laughlin, Incorporated, Harvey, Ill., manufacturers of turned shafting, have enlarged their plant four times since the establishment of their business, increasing it from a building of 60 x 128 feet to 125 x 400 feet, and from the employment of 15 men in the beginning they now have 85 men in service. They now have a capacity of 10,000 tons of finished material annually. The demand for their product has been so great during the past year that from running day turn they have now increased to double turn. They have recently also done some export business.

The Hanover Iron Works Company, Wilmington, N. C., have incorporated with a capital stock of $50,000 to do a general foundry and machine shop business. Address Iredell Meares. The other incorporators are S. W. Skinner and W. E. King of Wilmington.

Sir Weetman Pearson & Son, the English contractors, are said to have obtained a concession from the Mexican Government for the establishment of an electric plant in the mountains of the State of Puebla, where there is abundant water power. The capacity of the plant is put at 80,000 horse-power and the cost of construction at $12,000,000.

The Concord Foundry & Machine Company, Concord, N. C., are adding another story to their machine shop and making other improvements that will materially increase their capacity.

Certificates recently filed with the Secretary of State show that the Rand Drill Company, New York, have increased their capital from $250,000 to $1,250,000.

Considerable new machinery will be required by J. Stanley Winget & Co., York, Pa., for the plants they intend to erect for the manufacture of the Raby steel tie, patents for which they control. They have a bid from the E. W. Bliss Company of Brooklyn, N. Y., for special machinery for rolling and cutting the die. It takes about $50,000 worth of special machinery to make 4000 ties per day, which is as small a plant as will be located. The tie is made of sheet steel and when in place fastens the rails so that it is impossible for them to move a particle.

The Sturgeon Falls Pulp Company of Ontario, Canada, are building a large paper mill which will be operated by Westinghouse alternating current induction motors throughout. Besides eight motors, the order given the Westinghouse Electric & Mfg. Company includes a 560-kw. revolving field alternator, designed to be direct connected to a water wheel, with the exciter, switchboard and instruments to accompany the generator. The engineer and designer of the Sturgeon Falls plant is George F. Hardy.

J. L. Faulhaber of Fostoria, Ohio, has sold his foundry and machine shop to Cleveland people, who have incorporated under the name of the Fostoria Foundry & Machine Company. Among those now interested are O. C. Ringle, J. A. Olinger, C. H. Olds, Elmer E. Lyons, Frank Jones, and Walter Wainwright of Cleveland. In addition to the general foundry and machine business heretofore conducted the company will manufacture a specialty which will give employment to 20 molders and 15 machinists. The factory will be enlarged at once.

The plant of the National Drill & Mfg. Company, at Barberton, Ohio, is about completed and new machinery is being installed. The company were recently incorporated with $200,000 capital stock under the laws of West Virginia.

The Reserve Press Company of Cleveland have reorganized with $80,000 capital stock and have elected the following officers: Fred. C. Hay, president; W. N. Crafts, secretary-treasurer, and S. B. Smyth, vice-president and general manager. The company will manufacture presses, punches, forging machinery, special machinery and dies. They have recently installed considerable new machinery, including some large tools. They will remain in their present quarters for the present, but are planning to build during the coming year.

The Gould syndicate have purchased a large site near Maumee, Ohio, and it is stated they will erect large car shops to repair cars for the Wheeling, Wabash and Ann Arbor railroads. In the recent annual report it was recommended that $500,000 be set apart for the purpose.

Boilers, Engines, &c.

The Ironton Engine Company have been organized at Ironton, Ohio, and will manufacture the Allfree engine, now made at Indianapolis. The capital stock of the new concern is $200,000. In addition to making the Allfree engine the company will also make all kinds of steam appliances, castings and machinery incident to the engine trade.

Hull, Camp & Co., 125-127 Worth street, New York, manufacturers of and dealers in wrought iron pipe, fittings, valves and supplies for steam, water and gas, have incorporated as the Hull-Camp Company.

The Marinette Iron Works Mfg. Company, Marinette, Wis., have just installed a two-cylinder Walrath engine of 75 horsepower in their new factory. The fuel used in producer gas. They have also installed a 200 horse-power producer plant manufactured by R. D. Wood & Co., Philadelphia. The engine will be utilized to furnish power for the machine shop and dynamo for electric lights. A 30 horse-power double cylinder engine is already installed in the foundry, furnishing power to that part of the plant.

S. C. Dowell, Walnut Ridge, Ark., and others are organizing a company with a capital stock of $50,000 to build an electric light plant and to construct an electric railroad connecting that place with Hoxie. Later a water works system will also be installed.

The Morris Sherman Company, Chattanooga, Tenn., manufacturers of marine and stationary boilers, will build an addition to their plant.

It is stated that bids are wanted until January 5 by the Domestic Water Department, 322 Wilcox Building, Los Angeles, Cal., for double acting duplex pump of 4500 gallons capacity per minute. Bids will also be received for an inverted vertical engine.

The city and county hall trustees at Buffalo, N. Y., have recommended that electricity be substituted for the present system of gas lighting. It is estimated that a plant can be installed for $45,000.

The Old Colony Street Railway Company, Boston, will erect two power plants, one at Quincy and one at Fall River, Mass. The general arrangement of the stations has not yet been decided upon. C. F. Bancroft is engineer.

Borger Bros. & Co., Columbus, Ohio, boiler makers, have incorporated as the Borger Bros. Company.

We are officially advised that the report that the American Locomotive Company would spend $1,000,000 for making improvements at their Pittsburgh works, in Allegheny, Pa., is untrue. No improvements have been authorized at this plant at the present time.

Foundries.

The St. Louis Malleable Casting Company, 7701 North Conduit avenue, St. Louis, Mo., recently incorporated with a capital stock of $325,000, will erect a plant on 5 acres of ground adjoining the works of the St. Louis Car Company, who will take half the output of the new company. The plant will have a capacity of 50 tons of malleable and gray iron castings daily, and will represent an outlay of $100,000. It is expected to be ready for operation about May 1. The officers are: President, George J. Kobusch, who is also president of the St. Louis Car Company; Henry Luedinghaus, vice-president; Henry C. Duggan, manager, and Charles G. Ette, secretary and treasurer.

The Reed Foundry Company have been incorporated under Massachusetts laws with a capital stock of $75,000. F. E. Reed of the F. E. Reed Company is president, and John F. Kyes treasurer, and these officers and Eben F. Thompson constitute the Board of Directors. The company will operate a new foundry on Gold street, which is about ready to begin business.

Sayre Brothers, proprietors of the Peninsula Foundry Company, Newport News, Va., whose business they acquired last August, have thoroughly overhauled and remodeled the foundry and are making a specialty of structural iron castings and general brass work. The firm are prepared to supply the trade with almost anything in the casting line, and can offer prompt deliveries on general work.

Isaac G. Johnson & Co., New York, manufacturers of steel castings, have incorporated under the same name with a capital stock of $1,000,000. The directors are Isaac G. Johnson, Elias M. Johnson, Gilbert H. Johnson, James W. Johnson and Arthur G. Johnson.

The Toledo Plow Company, Toledo, Ohio, will double the capacity of their present foundry, which was erected early last year to replace the one destroyed by fire. The company are enjoying an immense business, and it was found necessary to double their output of castings at once.

Fires.

The Sidney Novelty Works, Binghamton, N. Y., were burned December 28, entailing a loss of $20,000.

Arbuckle Brothers' sugar refinery, on Plymouth street, Brooklyn, N. Y., was considerably damaged by fire December 25.

One of the large brick buildings of the Vaughn Machine Company's plant at Peabody, Mass., was destroyed by fire December 26. The loss is stated to be over $25,000.

The factory of the Standard Rock Candy Company, Brooklyn, N. Y., was destroyed by fire last week. The loss is about $200,000.

The Iron and Metal Trades.

The closing days of the year, while they have not brought much activity, have been marked by quite a fair accession of orders to the majority of producers.

The Iron industry will enter the new year with confidence, so far as the prospects of the first six months are involved. There is ample evidence that productive capacity, so far as it is available, will be taxed largely with tonnage on which delivery has been delayed and with requirements for the future. Beyond that time there is quite a general disposition to await developments.

Comparatively little has been done in Foundry Pig Iron in the principal distributing centers, nor have importers placed any further large orders abroad for shipment here. One significant circumstance observed in a number of cases is that large melters of Pig Iron have asked for anticipation of shipments on contracts, which would indicate that their consumption is outstripping their expectations.

Further inquiries for foreign Steel have come to hand, but not much business has been actually closed. There is also figuring going on in foreign Scrap.

Little that is new has developed in the Finished Iron and Steel branches. Moderate lots of Structural Material have been contracted for. In the Plate trade an interesting point is that the universal mill, nearly completed, of the Sharon Steel Company, purchased by the United States Steel Corporation, which was to be used for rolling Skelp, may be utilized to roll Plates. It has a capacity to roll Plates up to 51 inches.

The leading interest in the Wire trade winds up the year with an extraordinary movement of products. While the tonnage for December booked and shipped has been very large, it is stated that fully 20,000 tons more could have been disposed of if the material and the necessary cars could have been secured. The movement in the last few days of December was accelerated by the anticipation of advances in freight going into effect January 1. It was expected that if enough cars could be secured, the night of December 31 would see the company's warehouses swept clean.

The meeting of the independent Sheet Steel and Tin Plate manufacturers at Pittsburgh may lead to a fusion as the preliminary step toward securing a supply of raw materials.

In the Metal markets the only feature is a further advance in the price of Tin. The talk of a harmony of interests in the Copper trade has disappeared. Report has it that some sharp cutting of prices is going on in the Brass industry.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type, Declines in Italics.

At date, one week, one month and one year previous.

	Dec. 31, 1902.	Dec. 24, 1902.	Dec. 3, 1902.	Jan. 1, 1902.
PIG IRON:				
Foundry Pig No. 2, Standard, Philadelphia	$22.75	$23.00	$23.00	$16.00
Foundry Pig No. 2, Southern, Cincinnati	*21.75*	22.00	22.25	14.25
Foundry Pig No. 2, Local, Chicago	23.00	23.00	23.00	15.50
Bessemer Pig, Pittsburgh	**21.85**	21.25	21.75	16.75
Gray Forge, Pittsburgh	*20.00*	20.25	20.50	15.50
Lake Superior Charcoal, Chicago	*25.00*	25.00	26.00	18.50
BILLETS, RAILS, ETC.:				
Steel Billets, Pittsburgh	**29.50**	29.00	29.00	27.00
Steel Billets, Philadelphia	*27.00	*27.00	*26.75	29.00
Steel Billets, Chicago	*29.50	*29.50	*29.50	....
Wire Rods, Pittsburgh	34.50	34.50	34.50	34.50
Steel Rails, Heavy, Eastern Mill	28.00	28.00	28.00	28.00
OLD MATERIAL:				
O. Steel Rails, Chicago	18.75	18.75	18.75	14.00
O. Steel Rails, Philadelphia	21.00	21.00	21.00	18.00
O. Iron Rails, Chicago	*24.00*	24.00	24.50	21.00
O. Iron Rails, Philadelphia	24.00	24.00	24.00	21.50
O. Car Wheels, Chicago	24.00	24.00	24.00	16.00
O. Car Wheels, Philadelphia	20.00	20.00	20.00	16.75
Heavy Steel Scrap, Pittsburgh	21.50	21.50	21.00	....
Heavy Steel Scrap, Chicago	*18.25*	18.25	18.50	13.50
FINISHED IRON AND STEEL:				
Refined Iron Bars, Philadelphia	1.92	1.92	1.92½	1.65
Common Iron Bars, Chicago	1.75	1.75	1.75	1.65
Common Iron Bars, Pittsburgh	1.70	1.70	1.70	1.50
Steel Bars, Tidewater	1.75	1.75	1.75	1.70
Steel Bars, Pittsburgh	1.60	1.60	1.60	1.50
Tank Plates, Tidewater	2.10	2.10	2.10	1.78
Tank Plates, Pittsburgh	*1.75*	1.75	1.85	1.60
Beams, Tidewater	*1.90*	1.90	2.00	1.75
Beams, Pittsburgh	2.00	2.00	2.00	1.60
Angles, Tidewater	*1.90*	1.90	2.00	1.75
Angles, Pittsburgh	*1.90*	1.90	1.95	1.60
Skelp, Grooved Iron, Pittsburgh	1.90	1.90	1.92½	1.75
Skelp, Sheared Iron, Pittsburgh	*1.95*	2.00	2.05	1.80
Sheets, No. 27, Pittsburgh	2.65	2.65	2.65	2.90
Barb Wire, f.o.b. Pittsburgh	2.45	2.45	2.45	2.90
Wire Nails, f.o.b. Pittsburgh	1.85	1.85	1.85	1.95
Cut Nails, Mill	2.05	2.05	2.05	2.05
METALS:				
Copper, New York	**11.87½**	11.65	11.50	11.75
Spelter, St. Louis	*4.35*	4.45	4.82½	4.12½
Lead, New York	4.10	4.10	4.10	4.00
Lead, St. Louis	3.97½	3.97½	3.97½	3.95
Tin, New York	**26.50**	25.95	24.75	23.50
Antimony, Hallett, New York	*7.12½*	7.12½	7.25	8.25
Nickel, New York	40.00	40.00	40.00	60.00
Tin Plate, Domestic, Bessemer, 100 pounds, New York	3.79	3.79	3.79	4.19

* Foreign.

Chicago.

FISHER BUILDING, December 31, 1902.—(*By Telegraph.*)

Southern furnaces have shown more disposition to accept lower prices for contracts covering the first half of 1903, and in proportion to the holding off of buyers they have been solicitous for business. The result has been a further decline of about 50c. per ton for Pig Iron for such deliveries. On the other hand, there are several features which may tend toward the hardening of the market on the wave of the next buying movement, which is anticipated early in the year. Certainly the most aggravating and probably one of the most important features of the situation is the difficulty which both furnaces and foundries encounter in securing a steady and ample supply of fuel. The congestion of freight on local railroads at this point is severe and attributed by the carrying companies to lack of adequate terminal facilities to handle the enormous traffic. Temporary depots have been established at certain points within the city limits to facilitate the delivery of Coal and Coke, as well as perishable goods, but judging from reports little headway is being made against the accumulated and accumulating freight. A few important buyers have appeared in the market for Bar Iron. In the various lines of Steel the week has brought few changes of importance, and there has been a less heavy tonnage. Foreign business has been, temporarily at least, entirely suspended. The duties incidental to the closing of the year have to a marked degree occupied the trade, but this is of no significance. It is notable that to a considerable degree the weak spots have been strengthened, but in Galvanized Sheets, and in some instances, according to reports, in Pipe, concessions have been made necessary by keen competition.

Pig Iron.—Beyond the continued active demand for relatively small lots of Malleable Iron the market for Pig Iron during the week has been quiet. In many respects it is a waiting market. Buyers anticipating lower prices are holding off for concessions. On the other hand, while there is no disposition to press sales on the part of producers, it is evident that in some quarters at least buyers could make favorable contracts for the first half of 1903, and it seems that those consumers gifted with foresight would have taken advantage of this temper of the furnaces and placed contracts for unfilled requirements covering the first and second quarters of 1903. One would naturally suppose that as all contracts placed prior to January 1 are protected to March 15 from advance in freight south of the Ohio River the past week would have been a heavy one in tonnage placed, but such has not been the case. It will be remembered that on Friday, January 2, rates on Pig Iron north of the Ohio River will be advanced about 20c. per ton, and from Virginia furnaces the advance into this section will be 70c. per ton, 50c. to the Ohio River and 20c. beyond. While Foundry Iron other than Malleable has sold in 1000-ton lots and is still obtainable on the basis of $18 to $18.50 for No. 2, Birmingham, for delivery during the first half of the year, sales of small quantities ranging from carloads to a few hundred ton lots have sold for December and February delivery from $19 to $20 for No. 2 and $18.50 to $19 for No. 3. In some instances even longer deliveries have been made, but these are rather exceptional. No. 2 Southern Soft has also been sold at $20, Birmingham, and small lots of No. 1 as high as $21. Malleable Bessemer Iron for delivery during the second quarter of the year has been sold at $21 at the furnace, equivalent to $23.10, Chicago, for several hundred ton lots. There being so little Malleable Bessemer obtainable for early delivery, even in small lots, founders have been compelled to accept standard Bessemer, which has sold from $22 to $22.50 at the furnace, with $2.10 freight added to Chicago points. Charcoal Iron is still scarce and prices little better than nominal, although small lots are obtainable at quotations for shipment during the first quarter. Local producers are still hampered by inadequate supply of Coke, resulting from railway congestion at this point, which is now worse than it has been at any time during the past year. Under the circumstances prices of local Iron are of a nominal character and small premiums are obtained on moderate amounts for early delivery. There are several large buyers of the lower grades of Foundry, and also of Forge Iron, who seem likely to be forced into the market during January, and if there is no improvement in transportation facilities such buying seems likely to harden the market in the near future. Little is heard of foreign Iron, there being a disposition to discourage further melting of this kind. Small lots of Silvery Iron have continued to be sold on the basis of quotations. The following are the prices current for delivery, beginning in January:

Lake Superior Charcoal	$25.00 to $26.00
Local Coke Foundry, No. 1	23.50 to 24.00
Local Coke Foundry, No. 2	23.00 to 23.50
Local Coke Foundry, No. 3	22.50 to 23.00
Local Scotch, No. 1	24.00 to 24.50
Ohio Strong Softeners, No. 1	27.50 to 28.00
Southern Silvery, according to Silicon	26.15 to 29.15
Southern Coke, No. 1	23.65 to 24.15
Southern Coke, No. 2	23.15 to 23.65
Southern Coke, No. 3	22.65 to 23.15
Southern Coke, No. 1 Soft	23.65 to 24.15
Southern Coke, No. 2 Soft	23.15 to 23.65
Foundry Forge	22.15 to 22.65
Southern Gray Forge	19.15 to 19.65
Southern Mottled	19.15 to 19.65
Southern Charcoal Softeners, according to Silicon	27.15 to 27.65
Alabama and Georgia Car Wheel	29.15 to 29.65
Malleable Bessemer	23.50 to 24.00
Standard Bessemer	24.00 to 24.50
Jackson County and Kentucky Silvery, 6 to 8 per cent. Silicon	31.00 to 32.00

Bars.—There have been a few important buyers of Bar Iron in the market during the week, Agricultural Implement manufacturers buying about 500 tons and railroads and car works seeking to place contracts for delivery covering the first half of 1903. For such business the mills have quoted 1.75c., base, Chicago, but for smaller lots 1.80c. to 1.85c. has been demanded. There has been improved specifying for Soft Steel Bars on contracts, but the new business has again been light. Otherwise the character of the market is unchanged and prices remain as previously quoted. The following are the prices current: Bar Iron, 1.75c. to 1.85c.; Soft Steel Bars, 1.75c. to 1.80c.; Hoops, 2.15c. to 2.25c.; Angles, 1.85c. to 1.90c., base, mill shipment. The merchant trade for small lots has been only moderate, but the market has remained steady, Bar Iron selling at 2.15c., Soft Steel Bars at 2c. to 2.25c., Angles at 2.50c. and Hoops at 2.40c., base, from store.

Structural Material.—There have been but few large orders in the market, but contracts covering about 2500 tons, including 1200 tons for the Pope Building, have been placed for shipments beginning in January. There has been little if any inquiry for foreign Steel. For domestic Steels, mill shipment, prices are as follows: Beams, Channels and Zees, 15 inches and under, 1.75c. to 1.90c.; 18 inches and over, 1.85c. to 2c.; Angles, 1.75c. to 1.90c. rates; Tees, 1.80c. to 1.90c.; Universal Plates, 2c. to 2.25c. There has been little activity in the movement of small lots from local stocks, but prices have remained steady at the following quotations: Beams and Channels, cut to length, 2.50c. to 3c.; Angles, 2.25c. to 2.50c.; Tees, 2.30c. to 2.55c., at local yards.

Plates.—The situation is unchanged. A firm tone has prevailed, but no important contracts. The following are the prices current, mill shipment: Tank Steel, ¼-inch and heavier, 1.75c. to 2c.; Flange, 1.85c. to 2.10c.; Marine, 2.10c. to 2.20c. The movement from local yards has been on a moderate scale, but prices have remained steady, as follows: Tank Steel, ¼-inch and heavier, 2.25c. to 2.35c.; Tank Steel, 3-16-inch and No. 8, 2.30c. to 2.45c.; Flange, 2.50c. to 2.60c., all f.o.b. warehouse, Chicago.

Sheets.—The market has been less unsettled, as far as Black Sheets are concerned at least, but the volume of business has not been of a tonnage calling for special comment. The following are the official prices for Black Sheets, mill shipment, carload lots, f.o.b. Chicago: No. 20, 2.55c. to 2.60c.; Nos. 22 and 24, 2.60c. to 2.70c.; No. 26, 2.70c. to 2.80c.; No. 27, 2.80c. to 2.90c.; No. 28, 2.90c. to 3c. Small lots from store sell at 15c. to 20c. above mill quotations. Galvanized Sheets have continued to suffer from keen competition. Discounts vary from 75 and 10 on the base price to 75 and 10 and 10, with various freight allowances made. The following are the net prices: No. 27, 3.25c. to 3.50c., for mill shipment, and small lots from store at 3.40c. to 3.65c., Chicago.

Cast Pipe.—There has been an improved demand for moderate quantities from railroads and mining companies, and one order of 2000 tons of 4's, 6's, 8's and 12's has been placed during the week by the city of Chicago for shipment beginning in January. On large quantities manufacturers have reduced quotations, as follows: 4-inch, $36; 6-inch, $35; 8-inch and upward, $34 for Water Pipe; Gas Pipe selling $1 per ton higher, f.o.b. Chicago. For small quantities 50c. to $1 per ton more is charged.

Billets.—There has been a lack of animation throughout the market; some little inquiry for both domestic and foreign, however, but it has led to little business. Prices are a little better than nominal for foreign Billets at $29.50 to $30, duty paid, delivered at Chicago. Domestic Open Hearth Billets have continued to sell in moderate amounts to $36 to $40, according to analysis, buyer and time of delivery. Rerolling Bessemer Billets are quotable at $30, f.o.b. Chicago.

Merchant Pipe.—There has been a fair inquiry, with one or two important contracts placed, one being for 20 carloads of assorted sizes for delivery extending into April, 1903. There are two other important contracts pending, one for 70,000 feet and one for 600 to 700 tons assorted sizes, both for gas companies in the Northwest. The following are the official prices, Chicago base, random lengths, for mill shipment, carloads only:

	Steel Pipe.		Guaranteed Wrought Iron.	
	Black. Per cent.	Galvd. Per cent.	Black. Per cent.	Galvd. Per cent.
⅛ to ⅜ inch	66½	56½	63½	53½
½ inch	68½	58½	65½	55½
¾ to 6 inches	73½	63½	70½	60½
7 to 12 inches	71½	61½	68½	58½

Boiler Tubes.—There has been a moderate demand and a steady market. The following table of discounts is current for mill shipment:

	Steel.	Iron.
1 to 1½ inches	43½	38
1¾ to 2½ inches	56	36
2¾ to 5 inches	61	46
6 inches and larger	56	36

There has been very little movement from local stocks, and less disposition shown to make additional discounts to those given in the following schedule:

	Steel.	Iron.
1 to 1½ inches	35	35
1¾ to 2½ inches	47½	32½
2¾ to 5 inches	55	42½
6 inches and larger	47½	..

Merchant Steel.—There has been a fair inquiry for Merchant, Tire and Spring Steel, small orders having been placed during the week aggregating about 500 to 600 tons. There has also been some renewal of contracts for Crucible Tool Steel. For mill shipment prices are as follows: Smooth Finished Machinery Steel, 2c. to 2.10c.; Smooth Finished Tire, 1.95c. to 2.10c.; Open Hearth Spring Steel, 2.65c. to 2.75c.; Toe Calk, 2.25c. to 2.40c.; Sleigh Shoe, 1.85c. to 1.95c.; Cutter Shoe, 2.40c. to 2.60c.; Cold Rolled Shafting, 47 off in carload lots and 42 off in less than car lots. Ordinary grades of Crucible Tool Steel are quoted at 6½c. to 8c. for mill shipments; specials, 12c. upward.

Rails and Track Supplies.—Business during the week has been confined to several thousand-ton lots of Standard Sections, but there is still an urgent demand for light weights. Official prices for domestic Steel Rails remain unchanged at $28 for standard and $27 for second quality, mill shipment. Light Rails are selling, whenever offered, at $35 to $40, according to weight. The demand for supplies of all sorts has continued active and urgent, and the market firm.

as follows: Splice Bars or Angle Bars, 2c.; Spikes, 2.50c.; Track Bolts, with Hexagon Nuts, 3.10c. to 3.25c.; Square Nuts, 2.95c. to 3.10c.

Old Material.—The mills which have been holding off in anticipation of lower prices have been somewhat disappointed, as Open Hearth furnaces are ready buyers, and the offerings by railroads and other interests have been only moderate. There has been little if any increase in the supply of Old Car Wheels, but Relaying Rails have been in more ample supply. Prices, however, are little better than nominal in the absence of trading of moment. The following are the prices per gross ton, Chicago:

Old Iron Rails	.... to $24.00
Old Steel Rails, mixed lengths	$18.75 to 19.00
Old Steel Rails, long lengths	23.50 to 24.50
Heavy Relaying Rails	31.50 to 32.00
Old Car Wheels	24.00 to 24.50
Heavy Melting Steel Scrap	18.25 to 18.50
Mixed Steel	15.50 to 16.00

The following quotations are per net ton:

Iron Fish Plates	.... to $22.00
Iron Car Axles	$24.50 to 25.00
Steel Car Axles	23.50 to 24.00
No. 1 Railroad Wrought	19.50 to 20.00
No. 2 Railroad Wrought	17.50 to 18.00
Shafting	20.00 to 21.00
No. 1 Dealers' Forge	16.00 to 16.50
No. 1 Busheling and Wrought Pipe	14.00 to 14.50
Iron Axle Turnings	.... to 15.00
Soft Steel Axle Turnings	14.50 to 14.75
Machine Shop Turnings	13.50 to 14.00
Cast Borings	10.00 to 10.25
Mixed Borings, &c	10.50 to 11.50
No. 1 Boilers, cut	14.50 to 15.00
Heavy Cast Scrap	17.50 to 18.00
Stove Plate and Light Cast Scrap	14.00 to 14.50
Railroad Malleable	16.25 to 16.50
Agricultural Malleable	15.75 to 16.00

Metals.—A little firmer tone has been developed for Copper, but the market has remained quiet. Lake is held at 11⅝c. to 11¾c. in carload lots and 12c. in less than carload lots. Pig Lead has continued firm, and prices have remained stationary at 4.05c. in 50-ton lots, 4.07½c. in carload lots and 4.10c. in a jobbing way. Sheet Zinc has been barely steady and the market quiet, but prices have remained unchanged at 6¼c. in lots of 600 lbs. and over. Old Metals have been moderate in demand and steady, as follows: Heavy Cut Copper, 10¼c.; Red Brass, 10¼c.; Copper Bottoms, 9¼c.; Lead Pipe, 3.90c.; Zinc, 3.80.

Coke.—There has been a good demand for Furnace Coke, and some contracts have been placed at $3.50 to $4 per ton, the outside price for the first six months and the lower for the entire year. Foundry Coke is still scarce on the spot, and single cars are commanding $10 a ton, f.o.b. Chicago.

St. Louis.

CHEMICAL BUILDING, December 31, 1902.—(*By Telegraph.*)

Pig Iron.—The past week in Pig Iron circles has been marked by very quiet conditions. While some little demand rules for spot Iron, requirements are not of an urgent order, and the buyers seem to be generally in a waiting mood. The improvement recently noted in shipments from the furnaces is being well maintained. Coke more than Iron is the commodity which is causing the foundrymen the most anxiety at this time. Prices are holding well. We quote, f.o.b. St. Louis:

Southern, No. 1 Foundry	$24.25 to $25.25
Southern, No. 2 Foundry	23.25 to 24.25
Southern, No. 3 Foundry	22.75 to 23.75
Southern, No. 4 Foundry	22.25 to 23.25
No. 1 Soft	24.25 to 25.25
No. 2 Soft	23.25 to 24.25
Gray Forge	22.25 to 23.25
Southern Car Wheel	29.00 to 30.00
Malleable Bessemer	25.75 to 26.25
Ohio Silvery, 8 per cent. Silicon	31.00 to 32.00
Ohio Strong Softeners, No. 1	.... to ....
Ohio Strong Softeners, No. 2	.... to ....

Bars.—Conditions of trade among the jobbers continue along the same lines, and the volume of demand and inquiry is said to be on a fair basis. We quote from the mills: Iron Bars at 1.80c. to 1.90c. and Steel Bars at 1.80c. to 1.85c. Jobbers quote Iron Bars at 2.25c. and Steel Bars at 2.25c. in small lots from store, with 2.15c. in large quantities.

Rails and Track Supplies.—The volume of demand for Rails and Track Supplies continues as urgent and heavy as heretofore, and many new specifications are continually coming up. We quote as follows: Splice Bars at 2.05c.; Bolts, with Hexagon Nuts, 3.15c. to 3.35c.; with Square Nuts, 3c. to 3.10c.; Spikes, 2.25c. to 2.50c.

Angles and Channels.—Demand is still in fair volume on the jobbing trade for Small Angles and Channels, and quotations are unchanged. For material of this class 2.50c., base, is asked.

Pig Lead.—Pig Lead conditions show little change since last reported, and the volume of demand is not of a heavy order, but prices rule steady and firm. We quote Chemical at 3.97½c. to 4c. and Desilverized at 4c. to 4.05c.

Spelter.—While dealings in the Spelter market have been fairly heavy in volume the uncertainty in price conditions has served to check considerable of the outside demand. Prices have been tending toward a lower basis, but show fairly steady around the present level. We quote 4.40c. to 4.50c.

Philadelphia.

FORREST BUILDING, December 29, 1902.

The holiday season is not favorable for activity in the Iron market, and for the time being both buyers and sellers are "marking time" until it becomes necessary to enter into new deals. The feeling in many respects is better than it was a month or six weeks ago, but there are too many contradictory features to enable any one to size up the situation confidently. It needs no argument to prove that Pig Iron is scarce and that the cost of production will be high, but on the other hand foreign Iron will be brought in more extensively than ever, and how that will affect the market remains to be seen. Business must start up very shortly, but whether at higher prices or not is a debatable question. Higher freights go into effect on the first of the year, and the present attitude of sellers indicates that they expect buyers to pay the difference, whether present quotations are to be continued or whether excess freights are to be added.

Pig Iron.—There has not been much business during the past ten days, but there is a good deal of figuring around to see where we are at. Buyers want to find out what they can do, and in the meanwhile sellers of American Iron are asking a little more money to offset the higher freight rates. Until this question is settled we continue last week's quotations, but it is quite possible that 25c. to 50c. more will have to be added in the course of a few days. The case is undecided as yet, but there is so little Iron for sale that buyers have no alternative but to pay the price or fall back on foreign Iron as a substitute. With sellers it will probably be a question of expediency, as necessity hardly enters into the matter under present conditions. Prices are about as follows: Cargo lots of Middlesbrough No. 3, about $17, German (Westphalia), $20, and Hematites at $20 to $20.25. Such prices, however, are for full cargoes, c.i.f., duty paid, cash against documents. General quotations for deliveries in buyers' yards, usual terms, are as follows:

No. 1 X Foundry	$24.00 to $25.00
No. 2 X Foundry	22.75 to 23.25
No. 2 Plain	22.00 to 22.50
Gray Forge	20.50 to 21.50
Middlesbrough, No. 3	21.00 to 21.50
Scotch	22.50 to 23.50

Finished Material.—There is no change to report at the present time; holiday dullness pervades the entire market, so that for all practical purposes everything is in *statu quo*. The future looks almost anything that people may figure on. There is plenty of good material for optimistic views, but still more for uncertainty and indefiniteness. The problems of fuel, of transportation, of finance and of raw materials have to be dealt with in the near future, and until something tangible is developed it is not likely that there will be much if any change from the prices now ruling, and which are as follows:

Plates.—Small lots, 2.10c. to 2.15c.; carload lots, ¼-inch and thicker, 2c. to 2.05c.; Universals, 2c. to 2.05c.; Flanges, 2.10c. to 2.20c.; Fire Box, 2.25c. to 2.30c.; Marine, 2.30c. to 2.35c.

Bars.—Steel Bars, 1.80c. to 1.85c.; prompt shipments from local mills,. Western Steel, 1.75c. to 1.80c.; Bar Iron brings 1.92c. to 1.95c. for carload lots as minimum quantity.

Structural Material.—Small sizes are quoted at 1.72c. to 1.80c., but large sizes command all the way from 1.90c. to 2.10c.

Cincinnati.

FIFTH AND MAIN STS., December 31, 1902.—(*By Telegraph.*)

No one is looking for much in the way of change just now in the Pig Iron market. The trade, in addition to many other causes, is feeling the effects of the holiday season, and but little is doing beyond the inconsequentials. Trade such as it goes is not taken as seriously defining the coming situation when the next buying movement develops. Buyers regard the situation as soft and expect lower prices, while sellers admit that it is a hard turn to call. In the current run of trade, such as it is, one sees a gradual settling in prices, and there seems to be a feeling that good orders from desirable customers would not be allowed to pass away to other possible sellers, even if a sacrifice of 50c. had to be made. There is quite a little Southern Pig Iron offering for first half delivery, and the furnaces who are offering it seem to be pretty close together in the matter of prices, and $18.50 to $19, Birmingham basis, for No. 2 Foundry appears to be the size of it, with No. 4 and Mill Irons still out of the regularly accepted proportion. While foreign Iron is not being sold for a nearer delivery to this point than Buffalo yet it is admitted to be a very important factor in holding the market for domestic Iron at least down to the present level. The situation is undoubtedly strong from a statistical

position, and the generally accepted view among selling authorities is that the reaction in prices will, in any event, not amount to a slump with the probabilities favoring higher prices later on for spot orders. For last half deliveries the offerings are on the nominal basis of $18, Birmingham, for No. 2, but buyers are showing no interest in the proposition. Northern Irons are supporting themselves remarkably well, and are practically unchanged in price. Freight rate from the Hanging Rock district $1.10 and from Birmingham to Ohio River points $3.25. We quote, f.o.b. Cincinnati, for delivery to July 1, 1903, freight rates only guaranteed to March 1, as follows:

Southern Coke, No. 1	$22.75 to $24.00
Southern Coke, No. 2	21.75 to 23.00
Southern Coke, No. 3	20.75 to 21.75
Southern Coke, No. 4	19.25 to 20.75
Southern Coke, No. 1 Soft	22.75 to 24.00
Southern Coke, No. 2 Soft	21.75 to 23.00
Southern Coke, Gray Forge	18.75 to 19.25
Southern Coke, Mottled	18.75 to 19.25
Ohio Silvery, No. 1	30.60 to 32.10
Lake Superior Coke, No. 1	25.10 to 26.10
Lake Superior Coke, No. 2	24.10 to 25.10
Lake Superior Coke, No. 3	23.10 to 24.10

Car Wheel and Malleable Irons.

Standard Southern Car Wheel	$27.75 to $28.75
Lake Superior Car Wheel and Malleable	27.50 to 28.50

Plates and Bars.—We quote, f.o.b. as follows: Iron Bars in carload lots, 1.92c., with half extras; same, small lots, 2.20c., full extras; Steel Bars, carload lots, 1.72c., with half extras; same, small lots, 2.20c., full extras. Plates are quoted nominally, ¼-inch, in carloads, 1.70c.; same, 3-16, 1.80c. As a matter of fact, however, mills having Plates to ship are getting 2.15c. without trouble. I-Beams and Channels, 1.70c., base. All prices f.o.b. Cincinnati.

Old Material.—We quote dealers' buying prices, f.o.b Cincinnati, as follows: No. 1 Wrought Railroad Scrap, $20 per net ton; Cast Scrap, $16.50 to $17 per net ton; Iron Rails, $24.50 to $25, gross; Steel Rails, long, $23.50, gross; same, short, $18, gross; Iron Axles, $26.50, gross; Car Wheels, $21, gross.

Pittsburgh.

(*By Telegraph.*)

PARK BUILDING, December 31, 1902.

Pig Iron.—The last week of the year finds the Pig Iron market quiet as regards sales, but prices are firm. Shipments of Coke have been better this week and five or six blast furnaces in the Valleys, that have been down for some time, are getting ready to start. We quote Bessemer Iron for shipment through first half of next year at $21 at furnace, equal to $21.85, Pittsburgh, on the new freight, while for delivery in the first two or three months about $22 is quoted. We note sales of about 20,000 tons of Standard Bessemer Iron for first six months at $21 at furnace. We quote Gray Forge Iron at $20.50 to $20.75, Pittsburgh, and note a sale of 500 tons at the former price. There is very little doing in Foundry Iron. No. 2 for delivery in first three months is held at $22 to $22.50, Pittsburgh.

Steel.—There is practically no buying of Steel, but prices are very firm. We quote Bessemer Billets at $29.50 to $30 and Open Hearth Billets, Ordinary Carbons, at $30 to $31, Pittsburgh.

(*By Mail.*)

The year closes with the Iron trade in a very quiet condition, there being little new buying, but the general tone of the market is firm. This applies especially to Pig Iron and Steel, prices on both being strong, especially for delivery in first three months of 1903. The Coke situation is perhaps a little better and four or five blast furnaces in the two Valleys that have done very little for two or three months expect to start within a week, a sufficient supply of Coke having been received to warrant resumption of operations. The weather has been favorable for shipments, there having been very little snow. There is a constant dread, however, of bad weather, which would make the Coke situation worse than ever. Demand for Finished Material is strong in spots and dull in others. Tonnage in Plates, Structural Material and Pipe continues abnormally heavy, while some improvement is noted in Wire products and Tin Plate. Sheets are dull and the outlook is not very reassuring. Generally speaking, the prospects for next year are regarded as extremely good and it is believed tonnage in the first six months, at least, will be sufficiently large to keep well equipped plants running steadily. We can state officially that there is no prospect for the present, at least, of the United States Steel Corporation acquiring the blast furnaces and open hearth Steel plant of the Clairton Steel Company. It is said that no deals are on at the present time for the acquiring of other works by the Steel Corporation.

Structural Material.—No large contracts have recently been placed in this district. The prospects for 1903 could hardly be more encouraging, the Structural mills being already sold up for first six months or longer. There is still some delay in getting Zees and Eye Bars, but shipments of Beams, Channels and Angles are better than for some time. Prompt Beams and Channels continue to bring 2c. and higher.

Plates.—The regular quarterly meeting of the Plate Association will be held early in January. Tonnage continues heavy and some of the mills, notably Homestead Steel Works, are making some extraordinary records in output. Prompt Plates bring 1.75c. to 2c. at mill, and in cases where only a few Plates are wanted for quick delivery, better than 2c. is obtained. The Carnegie Steel Company are sold up for months ahead, but have not taken a single order at higher than the official price.

Sheets.—The item of interest in the Sheet trade is the taking for another year by the American Sheet Steel Company of the requirements of the National Roofing & Corrugating Company. The tonnage has been given out as 80,000 tons of Black and 30,000 tons of Galvanized, but this is probably too large. The American Sheet Steel Company have had this contract for several years. General demand for Sheets is quiet, but a larger business is expected after the first of the year. The independent Sheet mills are now in session in this city. They may decide to build a Steel plant and furnish their own Sheet Bars.

Rods.—The market is very quiet, and we do not hear of any sales. We quote Bessemer Rods at $34.50, but this would probably be shaded if any large tonnage were offering. Open Hearth Rods are about $1 higher.

Muck Bar.—No business is being placed, and we quote nominally at $32.50 to $33 for best grades of local Bar.

Hoops and Bands.—The leading interest report a better demand for Hoops and Bands, and the tone of the market is firm. We quote: Hoops from Bessemer stock at 1.90c. in 250-ton lots and over, and 2c. in carload lots, at mill. Bands are 1.60c. up to No. 12 gauge, with extras as per Steel Bar card. For Open Hearth stock, $2 a ton additional is charged.

Bars.—We note a considerable improvement in demand for Steel Bars, several good sized contracts having recently been placed. Specifications are coming in at a fairly satisfactory rate. The tone of the market on Steel Bars is very firm, and some of the large consumers are expected to come in the market shortly after the first of the year and place a good deal of tonnage. Demand for Iron Bars is not as large as in Steel, and the tone of the market is not very strong. On carloads 1.70c. is being named, with reports that in exceptional cases this has been shaded.

Ferromanganese.—The Carnegie Steel Company are again producers of Ferro, one of their Lucy furnaces running on this material. We quote English Ferro at $50 in large lots and $52.50 in small lots, delivered.

Spelter.—The market continues quiet, and prices are very weak. Prompt grades of Western Spelter are being offered as low as 4.62½c. to 4.65c., Pittsburgh. There is no buying, as consumers are holding off, believing that prices will be lower.

Merchant Steel.—There is nothing of special interest to note, tonnage is good and the mills have a good deal of work booked for first three months. For mill shipment prices are as follows: Tire, 2c. to 2.10c.; Spring, 2.25c. to 2.35c.; Toe Calk, 2.10c. to 2.20c., base; Sleigh Shoe, 2.15c. to 2.25c. Differentials are as follows: Less than 2000 lbs. of a size and not less than 1000 lbs., 10c. advance; less than 1000 lbs. of a size, 30c. advance; Cold Rolled Shafting is 47 per cent. off in carloads and 42 per cent. in less than carloads, delivered in territory east of the Mississippi and north of the Ohio rivers. Tool Steel is 6½ c. to 10c. for ordinary grades and 12c. and upward for special grades.

Skelp.—Market continues very quiet, there being almost an entire absence of buying. We quote Grooved Iron Skelp at 1.90c.; Sheared, 1.95c. to 2c., and Grooved Steel Skelp, 1.90c., f.o.b. Pittsburgh, or 2 per cent. off for cash in 30 days.

Merchant Pipe.—Tonnage continues large and all the mills have a good deal of business booked for delivery in first three months. There is some shading of prices by the outside mills.

Boiler Tubes.—Business is confined mostly to small lots, but the mills have heavy contracts for next year delivery.

Coke.—There is a heavy demand for Furnace Coke for 1903 delivery, and it is said as high as $5 to $5.50 a ton is being offered for first six months delivery. Contracts for Furnace Coke made some time ago were at $3.75 to $4 a ton, but it is doubtful if any more could be had at these figures. Strictly 72-hour Foundry Coke is $4.75 to $5 a ton on contracts. Output in the Upper and Lower Connellsville region is about 275,000 tons a week.

JAMES J. LONERGAN, president of the City Foundry Company, died in Cleveland, Ohio, December 26, after a very short illness. He had been active in the manufacturing circles of Cleveland for 15 years.

Cleveland.

CLEVELAND, OHIO, December 30, 1902.

Iron Ore.—The Ore market for the coming year is now in the formative stages. The vessel interests are figuring the probable relation of the supply of tonnage to the demand for it and the shippers are engaged in something of the same occupation. The Steel Corporation are contending for the same conservative price policy in the disposition of Ore as has obtained in the general Iron and Steel trade as far as they can control that market. The independent producers and especially the merchant mines have been very much disposed to demand an increase in the price, which inclination is supported by the understanding that territories not heretofore tributary to the Lake Superior region will draw an increasing amount of Ore from that territory during the coming year.

Pig Iron.—January 10 will have its effect upon the spot delivery sales. The Pig Iron situation all through the month of December has been prophetic of the better times that have lately developed in the Finished Steel trade, and the future buying at the present time seems to augment the impressions that have been gained within the last month. The market might therefore be said to be strong, but without any present activity of note for immediate shipment. The future market, however, presents a different aspect. The inquiries have been heavy and the selling has been considerable. The scarcity of Foundry Iron has not affected prices, for No. 2 is still bringing $23, Valley furnace, for first half delivery, while the Southern furnaces are quoting $20, Birmingham, for the same grade for the same period. On second half delivery a good deal has been done in this territory of late, indicating an increased activity here proportionate with that witnessed in other territories. The price has remained at $21, which seems to be the prevailing figure quoted. One small sale of Bessemer was made during the past week for January delivery at $23, and this seems to be the price at which most of the material that is finding its way upon the market is disposed of. The Basic producers have still withheld their Iron from the market, not knowing how much of it they will have for sale during the second quarter, although they have sold none for that period as yet. The Coke situation is still quite aggravating, and the shortage has been increased by the snow storm, which has prevailed all through this territory for the last week.

Finished Iron and Steel.—The increased demand for Steel Rails has been one of the interesting features of the market during the week. Some new work, which it has but recently been decided to do, in the way of connections between big systems, has brought on a need for some additional tonnage. The demand for Structural Steel has still been as brisk as formerly and the tonnage upon which inquiries are now being made is quite large. The price for mill sales is 1.60c. for the larger and 1.75c. to 1.85c. for small mills, with jobbers getting 2.25c. The Plate trade seems as strong as any other feature of the market and the outlook for a big development in the business is very bright for the second week of January. The smaller mills are finding that the demand for their material at premium prices is not quite so brisk as it might be, although they are holding on to the old quotation of 1.90c. to 2c. at the mills, which they are able to obtain on certain good specifications. The jobbers are not doing a very big business in Heavy Plate, but quote 2.25c. The Bar Iron situation is not over encouraging as yet. The demand for the material appears to be light and the market is easy. Some of the larger mills are quoting 1.80c. and claim to be getting it on new business. The smaller independent mills are quoting 1.70c., Pittsburgh, and in some instances it is not impossible to get material at 1.75c., Cleveland. The Bar Steel trade, on the other hand, is getting much more lively than it has been for the last few months, and the inquiries for new business seem to indicate that the trade will be as heavy for the first half as it was for the half that is just now closing. The inquiries which have been received in the last few days indicate that there is a good business ahead. The price which is being paid is 1.60c., Pittsburgh, for Bessemer, and 1.70c., Pittsburgh, for Open Hearth Steel Bars. The Sheet trade is still very dull and the market is weak. Quotations are 3.10c. to 3.25c. for No. 27 out of stock as a basis, with the same gauge bringing 2.85c. to 2.95c. at the mills. Galvanized Sheets are bringing 3.70c. to 3.85c. for No. 27.

Old Material.—The Scrap trade has been rather weak with conflicting rumors as to the future. For the present very little business is done, but what material is sold is placed on the old prices, which are as follows: No. 1 Wrought, $19, net; Iron Rails, $25.50, gross; Iron Axles, $28, net; Cast Borings, $12, gross; Car Wheels, $22.50, gross; Heavy Melting Steel, $19, gross; Old Steel Rails, $20, gross.

The H. B. Coho Company, 114 Liberty street, New York, have prepared a pamphlet showing a few of the power installations made by them. These include office buildings, factories, mills, &c.

New York.

NEW YORK, December 31, 1902.

Pig Iron.—Buying has been light, and, except with certain interests, there is no urgent demand. It is noted, however, that in some conspicuous instances large consuming companies have asked for anticipation of shipments on contracts, indicating that they have been melting Iron faster than expected. Few additional orders for importation have been placed lately. We quote for prompt delivery: Northern Iron, at tidewater, No. 1 X, $24.50 to $25; No. 2 X, $22 to $22.75; No. 2 Plain, $21.50 to $21.75. Tennessee and Alabama brands, in New York and vicinity: No. 1 Foundry, $24.50 to $25.50; No. 2 Foundry, $22.75 to $23.25; No. 3 Foundry, $21.75 to $22.50.

Cast Iron Pipe.—The demand for Pipe is greater than for many years at this season. Quite a number of lettings have occurred the past week, among them being 1200 tons of 48-inch at Boston and 500 tons at Providence, both of which went to an independent company. The total tonnage for the week was large and prospects are bright for a continuance of the demand. Prices, tidewater, are still about $34, gross ton, for 6 to 12 inch, but it would not be surprising if they should advance.

Steel Rails.—There are scattered inquiries, but no large business is pending. The last important order placed was that of the Great Northern, involving about 30,000 tons. Foreign Rails can be laid down at about $31.50, ex-ship, duty paid. In Girder Rails a larger order was recently placed in Boston. It was taken by an Eastern mill. We continue to quote $28 for Standard Sections at mill.

Finished Iron and Steel.—The most important contract taken by the leading bridge company the past week was for a bridge over the Missouri River for the St. Joseph & Grand Island Railroad. This bridge will consist of one swing span and three fixed spans and will require 3500 tons of Steel. It will be a combination railroad and highway bridge. The building trade is quiet, but numerous projects are taking shape in various localities which will soon be ready for letting. Plates are in some demand, but the orders placed the past week have not been numerous. Very good inquiries are in hand, which are expected to lead to business shortly. Coal shortage continues to cut down the output of the Eastern mills. We quote at tidewater as follows: Beams, Channels and Zees, 1.90c. to 2.25c.; Angles, 1.80c. to 2c.; Tees, 2c. to 2.25c.; Bulb Angles and Deck Beams, 2.10c. to 2.25c. Sheared Steel Plates are 2.10c. for Tank, 2.20c. for Flange, 2.35c. to 2.40c. for Fire Box. Refined Bars are 1.90c. to 2c.; Soft Steel Bars, 1.80c. to 1.90c. Foreign Beams are 1.75c., ex-ship, New York, in large lots.

Old Material.—The inquiry is much better, but consumers appear to be simply testing the market and not disposed to place immediate orders. They do not find as much Scrap in the market as they had expected and prices are a trifle firmer by reason of the inquiries. Dealers report small offerings by railroads. The demand for Relaying Rails is lighter, owing to the season, but some good sized lots have changed hands.

Old Iron Rails	$22.50 to $23.00
Old Steel Rails, long lengths	20.00 to 20.50
Old Steel Rails, short pieces	18.00 to 18.50
Relaying Rails, heavy sections	29.00 to 30.00
Relaying Rails, lighter sections	32.00 to 33.00
Old Car Wheels	20.25 to 20.75
Old Iron Axles	25.50 to 26.00
Old Steel Car Axles	24.50 to 25.00
Heavy Melting Steel Scrap	18.00 to 18.50
No. 1 Railroad Wrought Scrap Iron	21.00 to 21.50
Track Scrap	18.00 to 18.50
Busheling Scrap	14.00 to 14.50
No. 1 Machinery Cast Scrap	19.00 to 20.00
Stove Plate	13.00 to 14.00
Wrought Turnings, delivered at mill	16.50 to 17.00
Cast Borings, delivered at mill	9.00 to 9.50

Metal Market.

NEW YORK, December 31, 1902.

Pig Tin.—Although interrupted by the holiday of last week, speculation was resumed several days ago in the London market with the result of a further increase in prices. Sympathetic with the London advances, this market moved steadily upward, spot and futures to-day reaching 26.50c. bid, and 26.75c. asked. The London market reached its highest point yesterday, when the closing cable named £120 15s. for spot. To-day's cable showed a reduction from this figure on spot, but futures were higher. Prices were as follows: Spot, £120 7s. 6d.; future, £121. Business on consumptive account has been very low, both here and abroad, throughout the entire week. There have arrived here this month 3007 tons and 1990 tons are reported afloat. Deliveries this month have so far aggregated 2000 tons.

Copper.—Prices have been advanced, but even the very light demand which has marked the situation of late has diminished considerably. Pure manipulation is responsible for present prices, which are, acording to information given out in the trade, as follows: Lake, 11.87½c. to 12c.; Electrolytic, 11.75c. to 11.87½c.; Casting, 11.62½c. to 11.75c.,

and Standard is nominally quoted 11c. on 'Change. Simultaneous with higher prices here the London quotations have been shot skyward. There is as much, or rather as little, actual basis for higher quotations abroad as here. The London cable to-day announced £52 15s. for spot, £53 2s. 6d. futures, and £56 Best Selected. The latter figure shows an advance of but 10 shillings over last week's, but on spot and future Standard to-day's prices are £1 10s. higher than those of last week. To date the month's exports amount to 9900 tons. The annual statistics compiled by C. Mayer, secretary of the New York Metal Exchange, will be sent out on Friday. It is said in the trade that they will show an acumulation of just about the same proportion as that of a year ago.

Pig Lead.—This market is very dull and equally uninteresting. Official prices are unchanged on a basis of 4.12½c. for Desilverized spot, and 4.10c. futures. London is unchanged from last week at £10 16s. 3d.

Spelter.—No relief was offered in the way of better business and prices continued in their decline. Spot is now quoted here 4.70c., January, and February 4.62½c., and St. Louis, 4.35c. to 4.40c. London is still £19 17s. 6d.

Antimony—Is unchanged and easy at 8½c. to 8¾c. for Cookson's, 7⅞c. to 7¼c. Hallett's and other brands 6¾c. to 7c.

Nickel.—No change is noted. Large quantities down to ton lots are now quoted at 40c. to 47c. per lb., according to size and terms of order. Smaller lots are quoted as high as 60c., according to quantity.

Quicksilver.—The market is quiet and unchanged, the ruling quotations being $48 per flask of 76½ lbs. each in lots of 50 flasks or more. London is unchanged at £8 15s.

Tin Plate.—Quotations are unchanged, being based on present official prices of $3.60 per box of 14 x 20 100-lb. Cokes, f.o.b. mill, and $3.79, New York delivery. These prices, it is understood in the trade, will hold until April. The Swansea market is 1 shilling 3 pence lower, being quoted 11 shillings 9 pence.

The New York Machinery Market.

NEW YORK, December 31, 1902.

If reports in the trade, which we are unable to confirm at this time, but which emanate from good sources, are well founded, the new year is to witness another wide step in steam turbine practice. The report to which we allude purports that the De Laval Steam Turbine Company intend branching out into new fields and building large units. At present this company have a fine equipment at their Trenton plant, but it is limited to the production of turbines of about 200 horse-power. We are informed that the object of the new move is to build machines as large as 5000 kw. and when this limit has been reached to continue as high as practice demands. It is said that at the last directors' meeting of the company $500,000 was appropriated for the immediate equipment of a plant for the production of turbines of large units. Owing to the high speed at which these machines operate it is necessary to provide for them special types of generators. Thus far this company have purchased their generators in the open market, ordering them in large lots from certain electrical establishments. Whether the contemplated extension of the scope of the company's line provides also for the building of generators is still entirely conjecture at present. The impression in the trade, however, is that for the present the efforts of the company will be bent entirely in the direction of the building of turbines. A short time ago they embarked in the centrifugal pump business, so as to quote direct for complete pumping sets of their own manufacture. The demand for turbines has, however, taxed the works so heavily that the pump end of the business has been sacrificed for the time being. The general assumption is that the works will not be moved to any other point, but that the present plant at Trenton will be extended.

Within a few days bids will be received by the Interborough Rapid Transit Company, whose offices are in the Park Row Building, for all of the piping, tanks, valves, fittings and steam specialties required in the equipment of the great subway power station. The contracts, it is estimated, will aggregate $300,000. Just to give an idea of the sizes required we might mention that the exhaust pipes are to be 48 and 40 inch diameter. The low pressure mains are to be 30-inch and the largest high pressure 17 inches, inside diameter. Bids are being compiled both on the entire outfit and on the various separate sections or classes of materials required.

The constant growth of the demands for power has made it necessary for the New York Edison Company to make arrangements for new generators, rotary converters and transformers. The Stanley Electric Mfg. Company have secured, through the New York office, this important contract, which is notable not only on account of the total amount involved, but also because of the unusual size of the units. The first item in the contract is for four 2000 kw. S. K. C. rotary converters. The transformer equipment to accompany the same consists of 12 800 kw. S. K. C. static transformers of the air blast type, and four autoregulators. As is generally known, the largest rotaries hitherto built are the 1500 kw. units in the Manhattan substations, and therefore the construction of those of 2000 kw. capacity marks a distinct advance in the art. In addition, the contract calls for ten 1000 kw. S. K. C. rotary converters with 30 400 kw. S. K. C. static transformers of the air blast type, and ten autoregulators. The above apparatus is to be placed in various substations of the Edison system. Furthermore, the Stanley Electric Mfg. Company are to furnish three new generating units for the Waterside station. The machines are to be 3500 kw., 25 cycles, three-phase, alternating current generators, direct connected to engines working at 75 revolutions per minute.

The Babcock & Wilcox Company have just closed an additional order with the Commonwealth Electric Company of Chicago for 8000 horse-power of water tube boilers. They obtained an order from the Baldwin Locomotive Works for a 1200 horse-power water tube boiler plant to be installed in Philadelphia.

The Baltimore Bridge Company, Baltimore, Md., are preparing for the building of a very large bridge shop in addition to their present plant. The plans are not yet sufficiently developed to warrant any definite announcement of the amount of machinery equipment which will be required. Alfred M. Mosscrop, vice-president and manager, is in charge of the work.

The Davis & Farnum Mfg. Company of Waltham, Mass., are improving their works and contemplate an expenditure of something in the neighborhood of $15,000 to $20,000 for machine tools. Inquiries are being sent out by F. H. Brown, superintendent and treasurer. The company make a specialty of gas and sugar plant equipments, cast iron pipe, &c.

The Buffalo Forge Company have just booked another important contract for heating and ventilating apparatus for the Central Railroad of New Jersey shops at Elizabethport. The apparatus is chiefly for the cushion cleaning and pattern storage buildings. They have also taken a contract for a rather novel equipment. It is a down draft forge plant to be installed on the ninth floor of the Studebaker Building, which is located at Broadway and Forty-seventh street.

George F. Murphy, who was formerly connected with the De La Vergne Refrigerating Machine Company, R. Hoe & Co. and the Pond Machine Tool Works, has just organized the Murphy Engineering & Machinery Company. The offices are located at 97-99 Nassau street. The company, in addition to general consulting and contracting engineering, will make a specialty of designing and installing elevating and conveying apparatus and special labor saving machinery.

Patterson, Gottfried & Hunter, Limited, of 146-150 Centre street, New York, have been appointed general sales agents for the American steel split pulleys. They will carry a large stock covering all sizes.

Circulars have been sent out from the national headquarters of the Tin Plate Workers' International Protective Association advising the various lodges that it would be better to postpone the annual convention of the association, set for the first Tuesday in February, 1903, to the first Tuesday in May. The reason of this was the fact that the tin plate mills had been idle so long in various parts of the country that the men are scattered, and the convention, if held in February, would not get full representation that it would if postponed until May. It will be held in Anderson, Ind.

The number of shareholders of the United States Steel Corporation continues to increase. When the first dividend on steel common was paid on September 14, 1901, there were 13,918 common stockholders. The common dividend which is payable on the last of this month will be paid to 24,636 stockholders. The first preferred dividend which was paid on August 1, 1901, was paid to 18,569 stockholders. The dividend paid on November 15 of this year was distributed among 29,258 stockholders. The company now have on their books 53,894 stockholders, an increase of nearly 21,500 in 15 months.

The plant of the Snead Architectural Iron Works, Louisville, Ky., having been almost entirely destroyed by fire on the morning of December 20, that company are anxious to receive catalogues of all tools and machinery used in their business.

The International Edge Tool Company have extended their option on the majority of the stock of the Diamond State Steel Company.

The Prospects of the Pig Iron Trade.

BY ARCHER BROWN, NEW YORK.

It is difficult to take other than an optimistic view of the iron trade for the year on which we are just entering. We have closed up the chapter of 1902, with its singular succession of surprises, disappointments and contradictions. In spite of all drawbacks it has been a better year than was looked for at its opening. It has left, however, as its legacy to 1903 several factors which will keep the iron maker from taking an undue amount of ease until conditions are more settled. First of these is the transportation problem, the second is the shortage of fuel, the third is the greatly enhanced cost of manufacture and the fourth is the increasing demands, coupled with diminishing productiveness, of labor. The first two and the last two of these problems are closely linked together. The railroads are providing themselves with equipment at an unprecedented pace and the coke oven capacity of the country is being increased as rapidly as it is possible to increase it. We know, therefore, that it is only a question of time when these restrictions upon the output will be removed. The enhancement in cost, due mainly to advance in labor, is a more permanent and difficult factor to deal with.

Looking at the pig iron situation and prospects from the standpoint of the market a few striking points are pretty well defined. The production of the year, exceeding by a couple of million tons any previous year in our history, has fallen about 1,000,000 tons short of domestic requirements and the deficit has had to be supplied from Great Britain and the Continent. It seems incredible that we should long permit English and German furnaces to lay down their product in our Eastern and Central markets, paying ocean transportation and duty of $4 per ton. Sooner or later our furnaces must drive out the invaders, but they cannot do this while consumption continues at a rate of a million tons above the production. As near as can be ascertained it is still going at that rate. The invaders are therefore secure on our shores for some months yet. There is good reason to believe that increase of furnace capacity, by the building of new stacks and improvement of the blowing and heating power of old plants, is just about sufficient to supply the tonnage we are now taking from Europe; but this increase of capacity will make itself only slowly felt because of the fuel and railroad limitations already referred to. We ought to make in the year 1903 about 19,000,000 tons of pig iron, and unless new and unforeseen demand springs up the last half of the year should see us in full control of our own markets.

Markets are made by the balance between supply and demand. The present high level of prices, averaging probably 50 per cent. above the normal level of the past ten years, is due to a demand in excess of supply. When will this condition be reversed and the supply exceed the demand? Many large melters thought they saw evidence of this change coming late in November. The end of the anthracite strike; the heavy importations from abroad at prices below American prices; the close money market, threatening to put a damper on new enterprises —all these combined to make the buyer feel that his time had come. New buying stopped in November, and, so far as pig iron is concerned, little has been done since. As the year ends, however, it is admitted by all close observers that the market has not perceptibly weakened under this slack demand. Evidence from all quarters is that new work is coming in as fast as old work is being turned out. The decline in speculation and the closeness of money have, apparently, had but slight effect on the industrial and commercial world. It is true that many new undertakings, which depend upon the sale of securities for their financing, are indefinitely hung up. It seems to be equally true, however, that business coming forward in spite of this condition, is enough to take up the capacity of the mills and shops. It seems quite clear, therefore, that active buying must set in again soon, and, with furnaces booked ahead somewhat between 60 and 80 per cent. of their product to July 1, there is little danger of excess supply to unfavorably affect prices. It is known that some of the very largest consumers in the country have not been believers in the present market level and have made no provision beyond their immediate requirements. The balance between supply and demand, therefore, promises to be on the side of the seller for some months yet.

Considerable is heard about new furnaces under construction, the product of which will come on the market. There are five of these now building along the lakes, all of which are merchant furnaces. One at Detroit, one at Cleveland and one at Toledo are expected to be producing about the middle of the year. Two at Buffalo, adjoining the Lackawanna Steel Company's plant, will come in about a year later. The other new furnaces, in the Pittsburgh district and adjacent valleys, are mainly connected with the large steel corporations, and the product will be used by the owners. Notable among these are the Donora and Sharon plants, lately acquired by the United States Steel Corporation. There is but little in the way of new furnace construction south of the Ohio River, but considerable progress is being made in the improvement and rehabilitation of old plants. The output of Alabama and the Virginias may be expected to increase from 15 to 20 per cent. per annum from this cause. In spite of this the influence of Southern irons is less felt in Northern markets than for many years past. The cause is principally the large increase in the requirements of the steel works, mills and foundries that are growing up around the Southern furnaces.

It must be admitted that few people in forecasting the coming year care to look further than July. The feeling is general that there is time for a good deal to happen between now and the last half of the year, and that this contingency favors the buyers rather than the sellers, because of the general fact that prices are materially above the normal level. Against this view it can be urged that precisely the same arguments were used six or eight months ago with respect to the first half of 1903. Few prophets in the early part of 1902 ventured to predict a continuance of the present prosperity much longer than the current year. The most that need be said about the last half of the year is that there is nothing in sight to warrant the belief that the great tide of business prosperity is to receive any severe check during the year. Those who feared the effects of overspeculation have seen the speculative spirit thoroughly subdued within the past 60 days. Those who feared inflated prices of industrial and railroad securities have seen a fall in prices that has brought most securities to where intrinsic values are admitted, even by the conservative. Those who feared hostile national legislation against our great corporations have discovered nothing so far in the proposed action of Congress to alarm the timid. Those who feared that the great consolidations would stifle competition have found the reverse to be true. About the most that can be said against the continuance of the present prosperous conditions is that they are too good to last. This general statement receives emphasis from the depressed condition of trade in Great Britain and Germany, and the hopelessness of the writers in those countries as to the future. But, slowly, we begin to realize that this great nation in its physical and human resources does not admit of comparison with any other country.

Bessemer Coke Company.—Last week the Bessemer Coke Company, Lewis Block, Pittsburgh, operating a number of coke works in the Connellsville region, posted notices at all their plants notifying their men of a voluntary advance in wages of 8 to 10 per cent. This concern have always paid their men the very highest rate of wages that was possible, based on the selling price of coke.

The United States Steel Corporation have purchased the Breaker Island plant at Troy, N. Y. It consists of three blast furnaces, on which the work of remodeling has recently been pushed nearly to completion. There is also a basic Bessemer steel plant, which, however, is not regarded as suitable for operation.

PERSONAL.

H. E. Sheldon, manager of the sheet mills of the Allegheny Steel & Iron Company, at Avenue, near Pittsburgh, was presented with an automobile by the employees of that concern.

Charles C. Townsend of C. C. & E. P. Townsend, New Brighton, Pa., manufacturers of wire nails, is in Europe for an extended visit. He does not expect to return to this country before July next.

S. E. Treat, master mechanic at the Ohio Works of the National Steel Company, Youngstown, Ohio, has resigned.

H. C. Frick, having been interviewed by a Pittsburgh paper, states that if he was offered any position in the United States Steel Corporation he would not consider it, as his own affairs require so much of his time. He pays a high tribute to J. Pierpont Morgan and the management of the corporation, whose position he says is impregnable.

James A. Hunter has resigned as manager of the Kelly Nail & Iron Company of Ironton, Ohio.

Philip W. Moen, the retiring second vice-president of the American Steel & Wire Company, was presented with a magnificent solid silver loving cup by his associates in the Washburn & Moen offices and the New York office of the company and by workmen of the Washburn & Moen Works on Saturday noon, December 27. It was a complete surprise to Mr. Moen, who was sitting in his private office at Worcester, Mass., when the door opened and disclosed Fred. H. Daniels, general engineer of the American Steel & Wire Company, and 150 other men. Mr. Daniels made the presentation speech. The loving cup is of hammered silver in a design of dolphins and mermaids. In addition, Mr. Moen received, at the same time, a complete office set, roll top desk, table and chairs, all of quartered oak, for his private office, which he will open in the State Mutual Building, Worcester.

George M. Bard, vice-president and general manager of the Diamond State Steel Company of Wilmington, Del., has resigned. Mr. Bard was recently elected president of the Salisbury Steel & Iron Company of Utica, N. Y., to which he will now be able to give more attention.

A. Kennedy Ashworth, formerly of the firm of D. Ashworth & Son, consulting steam engineers, and later for a number of years in charge of the engineering department of the Pittsburgh Gage & Supply Company, Pittsburgh, has accepted service as assistant manager of the Underfeed Stoker Company, with headquarters in the Marquette Building, Chicago, after January 1, 1903.

Daniel G. Reid has been elected chairman of the Board of Directors of the Chicago, Rock Island & Pacific Railway Company.

J. E. Schwab has returned from Europe.

Adam Kiefer, for a number of years manager of the gasoline stove department of the Schneider & Trenkamp Company, Cleveland, has resigned to accept a similar position with the Allright Mfg. Company. Former employees presented him with a beautiful gold headed umbrella on his retirement.

New Industries at West Pittsburgh.

Some important new industries are being established at the new manufacturing town of West Pittsburgh, near New Castle, Pa. Among these is the new plant of the Garland Nut & Rivet Company, who are a consolidation of the rivet department of the Garland Chain Company of Pittsburgh and the Dunham Nut Company of Unionville, Conn. The main building, which will be 578 feet long, is well under way. This company will invest about $200,000 in their new plant, the product being rivets, nuts and chains. The American Interior Conduit Company of Waukegan, Ill., and Milwaukee, Wis., have been taken over by the Armorite Conduit Company of Rankin, Pa., and operations of these two concerns will be centralized at West Pittsburgh. The main building will be 550 feet long and is nearly completed. The company are capitalized at $500,000, and at the present time supply four-fifths of all the conduits used. They expect to employ about 500 men at their plant at West Pittsburgh, and will have a monthly pay roll of about $25,000. The West Pittsburgh Mill & Lumber Company are building a new plant at West Pittsburgh, the main building being 150 feet long, which will be extended later. The business of the concern will be to build houses for the workmen employed at the plants at West Pittsburgh. The West Pittsburgh Stone & Cement Company have been organized with a capital of $1,000,000, and are building a large plant at West Pittsburgh. They will manufacture cement for building purposes.

Trade Publications.

Friction Clutches.—The Minster Machine Company of Minster, Ohio, have designed a friction clutch for attachment to a wood split pulley. The clutch is made with a double grip friction ring secured to the pulley arms. The leverage is very great, so that only a few pounds is required on the lever to exert an enormous pressure on the friction surfaces.

Passenger and Freight Elevators.—The Moline Elevator Company, Moline, Ill., manufacturers of passenger and freight elevators, call especial attention in an illustrated pamphlet to the various types of machines which they are placing upon the market. The first two illustrations are of a direct connected freight elevator engine, which they commend for its heavy substantial construction, simplicity of parts and compactness. The next illustrations present two views of an improved worm geared belted freight elevator particularly adapted for service in factories and warehouses. Another illustration is given of a single belt electric elevator which is made in sizes of from 1000 to 5000 pounds. The machine is driven by a reversing electric motor, and is connected to the motor by a single belt.

Shapers.—We have received a valuable catalogue from the Cincinnati Shaper Company. The new works of the company, now in course of erection, will be located on a 3½-acre tract of ground in the heart of the machine tool industry of Cincinnati. The building will be of brick, slow burning mill construction. The main floor is 90 x 290 feet, three-bay form and unobstructed, except by two lines of posts. The offices and drafting rooms occupy a second story at one end of the building, and are 30 x 90 feet. The engine, generator and boiler rooms adjoin the main shop and cover a floor space of 40 x 78 feet. The efforts of the company will be devoted exclusively to the manufacture of shapers of the pillar or column and traverse head types. The company have gone liberally into jigs and special appliances to secure the high standard of accuracy for which their planers are noted. Their variable automatic power down feed, which may be applied to any of their pillar shapers and is regularly furnished with their traverse shapers, is adjustable for position of stroke and, not being dependent on springs, is positive in action. Their 24-inch crank shaper is especially equipped for mold and die work. It has a revolving table supplemented by a tilting top and vise with swivel base, permitting the work to be held at any compound angle.

Lathes.—A thorough description of the American lathe built by the American Tool Works Company of Cincinnati is contained in a catalogue just issued. This lathe is new from the drawing board up and embodies features which are radical departures in lathe construction. The 18-inch machine has a range of 44 changes of thread and 44 changes of feed instantly obtainable without removal of a single gear. The entire series of threads or feeds can be obtained, each change complete and ready to work, in 30 seconds. The lathe is intended to withstand the heavy duty now improved on tools because of the introduction of tool steels adapted to high speeds and liberal feeds. The 18-inch swing is the first of this pattern to reach completion; it will be followed in the near future by a 16-inch and other medium sizes.

A pamphlet by the Buffalo Forge Company, Buffalo, N. Y., describes and illustrates some of their heating and ventilating appliances.

"Electric Traveling Cranes" is the title of a handsome catalogue by the Cleveland (Ohio) Crane & Car Company. The engravings show many plants of different character in which these cranes have been placed.

The Benjamin Eastwood Company of Paterson, N. J., have issued a pamphlet showing their pulleys, bearings, shaft couplings, &c. The company also manufacture shafting and a complete line of silk machinery.

A very complete catalogue has been issued by the J. A. Fay & Egan Company of Cincinnati describing their latest forms of sandpapering machines.

A Meeting of Independent Sheet and Tin Plate Manufacturers.

Under date of December 19, 1902, A. F. Baumgarten of 518 Park Building, Pittsburgh, sent out a call for a meeting of independent sheet and tin plate manufacturers to be held in the Hotel Lincoln, Pittsburgh, on Tuesday, December 30, at 10 a.m., "to discuss the present situation of the market, the recent cuts in prices made by the United States Steel Corporation, future action of independent manufacturers and such other questions as arise relative to mutual protection that may be of interest to the independent manufacturers."

It is understood that the principal action to be taken at this meeting is the question of the independent sheet and tin mills going together and building a steel plant to make sheet and tin bars, and possibly one or two blast furnaces. Some of the independent sheet manufacturers will advocate the purchase of coal lands, ore properties, and the building of blast furnaces and a steel plant. The independent manufacturers realize that their position would be much stronger if they had blast furnaces and steel works back of them. The relative high prices of sheet and tin bars, together with the recent reduction in prices of tin plate and sheets, have put the independent manufacturers in the position that some action to protect their own interests has become imperative. On December 27 Mr. Baumgarten sent out a second letter, stating that he had received responses to the call for the meeting from a number of large concerns, including: Waukesha Sheet Steel Company, Waukesha, Mich.; Muskingum Valley Steel Company, Zanesville, Ohio; Youngstown Iron Sheet & Tube Company, Youngstown, Ohio; Laughlin Nail Company, Martin's Ferry, Ohio; Whitaker Iron Company, Wheeling, W. Va.; Berger Mfg. Company, Canton, Ohio; Carnahan Sheet & Tin Plate Company, Canton, Ohio, and others. Indications promised a very full meeting.

PITTSBURGH, PA., December 31, 1902.—The meeting of independent sheet and tin plate mills, held in Pittsburgh on Tuesday, December 30, was well attended. Among important concerns represented were: The Muskingum Valley Steel Company, Zanesville, Ohio; Niles Iron & Sheet Company, Niles, Ohio; Empire Iron & Steel Company, Niles, Ohio; Whitaker Iron Company, Wheeling, W. Va.; Youngstown Iron Sheet & Tube Company, Youngstown, Ohio; Berger Mfg. Company, Canton, Ohio; Waukesha Sheet Steel Company, Waukesha, Wis.; Carnahan Sheet & Tin Plate Company, Canton, Ohio; Waynesburg Forge, Sheet & Tin Mills, Waynesburg, Pa.; American Rolling Mill Company, Middletown, Ohio; Newport Rolling Mill Company, Newport, Ky.

In the absence of W. L. Giessner of the Laughlin Nail Company, Martin's Ferry, Ohio, F. J. Patterson of the Waukesha Sheet Steel Company was appointed chairman of the meeting.

While no official report of the action taken has been given out, it is understood that the present condition of the sheet and tin plate trades, both as regards prices and supply of steel, was thoroughly discussed. To run their mills at a profit it is necessary that some definite action be taken looking to the securing of a regular supply of sheet and tin bars at prices that will permit them to compete with the leading interest and protect capital already invested in plants. Just what may be done in this direction has not been fully decided. It is intimated that a consolidation of leading independent sheet and tin plate mills may be made, and that possibly blast furnaces and steel works may be erected by the consolidated interest if the mills should unite. A committee will probably be appointed to take up these matters and report at a future meeting.

Charles Thompson Neale, president of the Kittanning Iron & Steel Mfg. Company, died in Pittsburgh, Pa., on December 21, from heart disease, aged 70 years. He was born in Kittanning, Pa., and went to Pittsburgh in 1858, engaging in the hardware business with Wolfe, Lane & Co. He remained a member of the firm until 1879, when he organized the Kittanning Iron & Steel Mfg. Company, with which he was connected up to the time of his death.

Iron and Industrial Stocks.

Transactions have been on only a moderate scale the past week and fluctuations have been narrow on most stocks. The only industrials on our list showing a change of more than $1 per share have been American Can and Otis Elevator. Can preferred rose from 45½ to 47½ on reports of excellent earnings, and Otis common rose from 40¼ to 42½. The market was firm throughout, with a rising tendency. It is expected that an improved demand will be experienced in January from reinvestment of interest and dividends.

Disbursements on the stocks and bonds of railroad, industrial and miscellaneous corporations during January will aggregate $138,956,356, as compared with $132,813,746 in the corresponding month of 1902. In fact, January, 1903, disbursements will exceed like payments in any corresponding month in history. In dividends railroad companies will pay out $28,577,648; industrials, $21,326,134; traction, telegraph, &c., $10,190,138, a total of $60,093,920. In the matter of interest the railroads will disburse $55,102,267; New York banks and trust companies, $4,000,000 (estimated); municipalities, $10,000,000 (estimated), and industrial and miscellaneous, $9,760,169.

Consolidated Lake Superior Company.—Following the successful negotiations with Speyer & Co. for a loan of $3,500,000 by the Consolidated Lake Superior Company several changes have been made in the Board of Directors. To make places for representatives of the banking syndicate on the board, F. S. Lewis, W. P. Douglas, Edward C. Lee and James Butterworth offered their resignations, which were accepted. To fill the vacancies thus created the board elected Charles McDonald and Charles H. Tweed of Speyer & Co., New York; Horatio G. Lloyd, president, and Thomas Devitt Cuyler, vice-president, of the Commercial Trust Company of New York. James S. Swartz, who has been a member of the board for several years, was elected vice-president to fill the vacancy occasioned by the resignation of E. C. Lee. It is stated that Charles H. Tweed will probably be elected president.

Rhode Island Perkins Horseshoe Company.—The directors have sent a circular to the shareholders recommending that the stock be decreased from $2.750,000 to $1,000,000, all of one class and in $100 shares. Holders of the present preferred stock [$1,750,000] are to receive 36 per cent. of their present holdings in common stock and an addition, pro rata, $190,000 stock and $41,875 in cash to represent the 13¼ per cent. ($231,875) of accumulated dividends. The holders of the common stock ($1,000,000) will receive 18 per cent. of their present holdings in common stock. The reduced capitalization, it is believed, will make the market price of each share not only actually but relatively higher than the market prices recently prevailing. It will also produce a saving in the annual franchise taxes, payable to the State of New Jersey alone, of $1750. Moreover, with all the stock of one class "the possibility of a conflict of interests will be avoided, and with the decreased capital stock, such as proposed, the earnings on the basis of the year ending June 30, 1902, will be fully 9¼ per cent."

The United Shipbuilding Company have filed with the New York Stock Exchange a statement of their earnings for the quarter ending November 30, 1902. The net earnings, including those of the Bethlehem Steel Company, were $1,163,022, from which are deducted reserves on estimated profits on contract work in shipbuilding construction, $74,138, and for accrued interest and sinking fund payments on all bonds, $391,667, leaving surplus earnings $697,217.

Dividends.—The American Brake Shoe & Foundry Company have declared the regular quarterly dividend of 1¾ per cent. on their preferred stock, and also the first dividend of 1 per cent. on their common stock.

The American Screw Company have declared a dividend of 2 per cent. from the earnings of the year 1902.

William Perkins Tyler, president of the Tyler Tube & Pipe Company, and the Tyler Rolling Mills of Washington, Pa., died on December 27, at the Waldorf-Astoria, New York City, aged 53 years. He was born in Boston, Mass., and had been engaged in the iron business from his youth. As a young man he became the New England agent for the old firm of Morris, Tasker & Co. of Philadelphia, and a member of Tomkins & Co. of Boston, afterward Tyler Brothers. In 1888 he founded the Tyler Tube & Pipe Company, of which he became president, and the Tyler Rolling Mills of Washington, Washington County, Pa., building up Tylerdale, a suburb of Washington, Pa., into a thriving manufacturing town.

HARDWARE.

IN the following pages some attention is given to a retrospect of the year, both as to the course of the Hardware market in leading lines and the tendencies and developments of the trade in its broader relations. This matter, as it deals with the past, is of chief interest in its bearing on the future course of things. There is thus given a starting point for an intelligent preparation for the new year, and the experiences thus recalled may suggest something in regard to efforts or policy for the future. Our readers, however, have a more practical interest in questions that relate directly to 1903. One of the inquiries most frequently made, and receiving very varied answers, is as to the continuance of the prosperity which has made 1902 notable even among the recent prosperous years. How long the present great volume of business, with its remunerative prices, is to last is a question which has a most direct bearing on the course to be pursued by both merchants and manufacturers. If it is soon to end and a period of depression to ensue, with demoralized values, a wise policy will call for caution and conservative management, a taking in of sail and getting ready for the squall. If, on the other hand, there is to be a continuance of general well being among the people and anything like the present pace in trade, continued enterprise and even the extending of business interests would be justified.

It is obviously impossible to forecast the future with anything of definiteness and certainty. The course of the market, the ebb and flow of demand, the coming and going of prosperity, are subject to so many contingencies and affected by so many influences that the attempt to answer positively the question as to the length of time that present conditions will hold would not be made, except as a plausible conjecture or a probable inference from present indications, by any one whose opinion would be worth having. It is, however, the part of wisdom to make a careful survey of the field so as to form an intelligent opinion on which, within the limits of prudence, plans can be made for business during the months to come. We accordingly present a mass of information bearing on the subject. It is contained in letters from manufacturers, jobbers and retail merchants, who represent all sections of the country and practically all the departments of the Hardware trade. They are given as containing two classes of information on which an intelligent judgment can be based. Their most important usefulness is in reflecting the actual conditions under which our correspondents are transacting business, the state of things which exists in their various communities. Just in proportion as there is welfare among the people—farmers making money, factories busy, capital enterprising, labor employed—is there ground for looking for a continued activity in business, which in turn will do its part in contributing to the general movement and the prosperity of the country at large. The advices from retail Hardware merchants are especially valuable in bringing together a multitude of facts of this character which may be relied upon as coming from men of caliber and ability, in close touch with conditions in their communities and who write without bias.

While the letters of our correspondents have their chief value in the facts presented, from which our readers can form their own judgment of the probable course of business, they have an added usefulness in the opinions expressed as to the prospects for the opening year. These opinions, we may presume, have been carefully formed and the different influences likely to affect trade taken into account. Even those from the retail merchants, whose important field of operations is comparatively limited, are of value in proportion as the writers are accustomed to taking a broad view of things and are students of the general causes which promote or interfere with prosperity. The views given in the communications from jobbers and manufacturers are entitled, however, to special weight in this connection, as they express the mature judgment of men whose business covers a wide field and demands constantly a comprehensive survey of the situation, not only in the direction of the raw material, but also in the marketing of their products, which brings them into contact with all portions of the country and with commercial and manufacturing interests in general. Their forecasts for 1903 will therefore be perused with special care and their opinions given the weight to which they are entitled.

The hopeful view of business for the new year which is taken by our correspondents as a whole cannot fail to impress itself on those who scrutinize these advices. With here and there a note of doubt or wavering, which it is the part of wisdom to recognize, their tenor is confident and indicates a general expectation that business for 1903 will be on something of the same lines as 1902. That the manufacturers, as a rule, express even more sanguine views as to the prospects for trade than do the retail merchants is noticeable and suggestive. It remains to be seen which will be the more nearly justified by the developments of the year.

It is gratifying not only to recall a year which has been characterized by exceptionally prosperous conditions, but to look forward to another in which ample opportunities are promised for skill, industry and enterprise to make business both in the manufacturing and distributing branches of the trade satisfactory and profitable. While there is reason to keep constantly a watchful attitude to discover early signs of interruption of the existing prosperity, there may be a feeling of confidence in the carrying on of business and the anticipation of a good measure of success. It should be the aim of each merchant and manufacturer so to combine enterprise and judgment, confidence and conservatism, that his own interests may be directed wisely and profitably, thus as far as his influence goes tending to postpone as long as may be the reaction from existing extraordinary conditions, the promise of which meanwhile will, we trust, be so fully realized by our readers as to contribute liberally to the making of 1903 a HAPPY AND PROSPEROUS YEAR.

IN another column we print a letter from a wholesale Hardware merchant recommending a course of action which in his judgment is desirable for the protection of the jobbing trade in the presence of what is referred to as a new peril or problem by which, in the opinion of our correspondent, they are confronted. Whether the extent to which manufacturers determine the selling prices of their goods, allowing the jobber a differential which is seriously less than the cost of doing business, calls for special measures on their part, is a question into which we will not enter at this time. In many strictly Hardware lines there certainly seems to be a disposition on the part of manufacturers adequately to protect the interests of their jobbing customers, through whom many of them are regularly distributing

a large portion of their output. In many of these lines the margin allowed the jobber is apparently ample. If it were in all cases maintained they would have little reason for complaint.

Apart from the general features of the plan, which will doubtless be differently regarded by the various interests in the trade and to the practical carrying out of which there are obvious difficulties, the description of the class of houses which are to be regarded as Hardware jobbers will call out more or less criticism. In view of the interests of the large Hardware jobbers, who occupy an exceedingly important place in the market, the requirement, in order to be ranked as a jobber, of the employment of only two travelers, with annual sales aggregating $100,000, will seem to some to be a letting down of the bars, especially if all jobbing houses are supposed to be in the same class and entitled substantially to the same prices. On the other hand, there are many houses receiving jobbers' prices whose business is materially less than the quantity specified, who in many cases have apparently secure places in the classified lists of manufacturers of their associations. It is obvious, too, looking at the proposition in some of its broader relations, that anything in the way of such a general protection of the jobbing trade with the minimum of business as moderate as is suggested by our correspondent would tend to encourage the small jobbers who do a business in territory within easy reach, and would in the same degree militate directly against the interests of great houses that attempt to cover a wide extent of territory, much of which is necessarily remote from their scene of operations.

The general question as to what character and extent of business entitles a house to standing as jobbers is obviously one on which general agreement is not to be looked for, in view of the conflicting interests involved and the various ways in which it will be regarded by the manufacturers, whose policy as expressed in the prices they make practically determines the matter. They are usually desirous of selling the very large jobbers, but at the same time most of them prefer to have relations with a large number of houses, and for this reason consider the smaller jobbing houses exceedingly valuable customers.

IN connection with the letters given in the following pages in regard to syndicate buying, which express the views of representative manufacturers and jobbers on this somewhat complicated question, it will interest our readers to know that the negotiations between the syndicate buyers and the secretary of the National Hardware Association are progressing favorably. We are advised that the probable result will be the elimination of something like 50 houses from the lists of the syndicate buyers on the ground that their business is not of sufficient volume to entitle them to a place with the more extensive jobbing houses for whom the buyers are acting. The aim of the jobbers' association is to do away with the evils of having large and small houses uniting in their interests in the purchase of goods and receiving practically the same quotations through the medium of the price sheets which are issued by the syndicate buyers. The extent to which this revision of lists will be carried remains to be seen, as well as the effect the approval of the lists as amended may have on the standing of the system before the trade. It is to be presumed that if the syndicates yield thus much to the jobbing interests they will expect to obtain some recognition or more substantial advantage in return. What effect, too, the exclusion of these houses from the lists may have in encouraging the formation of syndicates representing the smaller jobbers is a phase of the subject which has perhaps been but partially considered by the larger jobbing houses, in whose interest the revision appears to be made.

Condition of Trade.

As there evidently exists a widespread optimism as to the quantity and quality of the spring business, it may be well to analyze the conditions upon which this feeling rests. Most potent of all is the agricultural situation, for all of our prosperity and well being finally rests upon the products of the soil. Broadly speaking the cotton growing sections of the country are not so well off as those given largely to the production of grain, though, again, the cotton States can be greatly differentiated in this respect. The cotton crop will certainly not be a large one; probably not varying much from that of 1901, but will command a price which will be remunerative to the planter. Farm products are all commanding good, even high, prices; crops are bountiful and the tillers of the soil—in all sections—are in better condition than for a generation past. They are mostly out of debt; farm mortgages have been lifted and the evidences of improved methods of living, conveniences, and to a great degree, luxuries abound on every hand in the agricultural sections. Of this evidence is found in the introduction of the refinements of modern life—as for example, porcelain bathtubs and telephones in farm houses all over the country.

Next in importance is the condition of the wage workers, of all kinds and conditions, particularly as regards their purchasing power. Manufacturers generally throughout the country and the railroads have been advancing wages, and the upward movement still continues. This state of affairs prevails likewise, though in lesser degree, in commercial life. Wages and salaries are the last to feel the advance, and also, both logically and fairly, are the last to be affected by the decline. It does not affect the present condition for us to realize that some day we shall have to readjust ourselves to a lower level, and in a way that certainly will not be pleasant.

The prices of staple items in Iron and Steel manufactures have already marked the beginning of the end of the present state of affairs by commencing a decline which must reach not only manufactured articles, but likewise, in time, both the necessaries and luxuries of life. The great question is whether there is sufficient ground for the hope that there will be a gradual decline in values and a gradual falling off in demand by which we shall slowly adjust ourselves to new conditions instead of being forced to do so with a sudden wrench.

Amid the very favorable conditions which exist and the promise of the spring trade, it is well to bear in mind the indications that point to a halt in the present pace, and retrogression to a more ordinary activity in business. Whether this will come with the middle or the end of the year, or be still longer deferred, remains to be seen. In connection, therefore, with courage and enterprise in the prosecution of business it is fitting that conservatism and caution be within easy reach. Whether future good crops will prolong the present impulse is a question that need not be entered into at this time, but barring unforeseen disturbances the opening year has promise of a golden harvest for those who are prepared to reap it.

Chicago.

(*By Telegraph.*)

Manufacturers of most lines of Heavy Hardware, including Bolts, Nuts, Bolt Stock, Screw Stock, Weaving Wire, Spring Wire, to say nothing of Plain Wire, Barb Wire and Wire Nails, have booked an enormous business. This applies equally to combination and outside interests. Some of the independent manufacturers have orders extending into March and April of 1903. So heavy has been the pressure that manufacturers have been obliged, as a measure of self protection, to turn down orders which have come in late. It is well known that freight rates will be advanced on the first of the year, and business from Denver and other Colorado points has been especially heavy during the week, the demand from that section including Bars, Shapes and Wagon Material of various kinds. In large measure the jobbing trade has felt the lull incidental to the usual stock taking time, there being a perceptible falling off in orders for both special and general lines. However, the cold snap has again stimulated the demand for Skates, Sleds, Snow Shovels and other winter goods, and stocks of this character are very low and much broken. There has been quite heavy volume of business in Screws, the recent merging of several interests being interpreted to mean an improved market. There seems to be no doubt that eventually there will be an advance in prices, or at least a more stable market. For many months, if not the entire year, this department of the business has been demoralized as far as making discounts is concerned, and that steps should be taken to eliminate destructive competition is not only natural, but the great wonder is that it has not been accomplished long since.

St. Louis.

(*By Telegraph.*)

The jobbing trade close their books on the old year, and the showing of the returns from all departments is generally a very encouraging and satisfactory one. It is true that during the past year greater efforts than ever before were made, much new territory was invaded by larger forces of salesmen, and activity in the home department was also more pronounced. Plans for the new year's campaign are on a more liberal scale, and the trade are to be congratulated on the generally encouraging and healthy condition to start with. Preparations for the coming World's Fair will be an important factor in this year's sales, and the demand for Builders' Hardware of all kinds is expected to be very prominent. All classes of Shelf and Builders' Hardware continue in lively demand, and liberal orders are being booked for Wire Cloth, Poultry Netting, Window Screens and Screen Doors.

Boston.

Bigelow & Dowse Company.—As this communication is to appear in your next issue of January 1 and at the commencement of the new year of 1903, it may not be inappropriate to refer to the year past and say a word on a topic that was of such vital importance as "consolidation." A year ago the whole country was discussing its advantages and disadvantages. Each writer assumed to argue from his own point of view, being entirely ignorant of the real plans and conditions. Those more familiar with the subject were quietly working and could see no advantage in a public discussion. Every feature and condition was carefully considered and explained to the parties interested. The roll of signers who had given their consent to consolidation is no mean tribute to the convincing arguments, genius and interesting efforts of him who was a thorough and conscientious believer in the work he had undertaken.

Consolidation was to be the panacea for the cure of many evils now existing in the Hardware trade. Many believe still, as firmly as ever, that for self protection the trade will eventually need to combine.

Conditions are not favorable when all are making money, and the increased expenses are more than made up in increased volume of business, but there is a time in the future when conditions will change and demand new ways and means for accomplishing present results.

When that time comes the old plan of consolidation which has been so freely discussed may assume a new form, and the failure of 1902 may result in future improved conditions that will benefit the whole Hardware trade. The past experience with the methods of the various large combinations has been very satisfactory and profitable to the jobbers who are giving them loyal support. All are interested in a strong and steady market which has generally been well maintained.

We have seen the working of outside manufacturers struggling for trade, cutting prices and trying to upset jobbers' profits that were being protected by the large combinations.

On general principles the jobbers have been loyal to the manufacturers who protected them and the outsiders have been forced to go to the smaller dealers. Under present conditions the trade are not favoring the establishment of new competition. The action of the Shovel manufacturers in reducing prices has cleared the field and toned up the market. The volume of the past year's business will generally exceed that of the previous year, and the results should be about the same.

While labor has been fully employed and all the manufacturing plants are running full time and everything is prosperous, there is a limit to trade in New England, but it can be depended upon from year to year. We have no great rush in good times, nor an almost complete stagnation in others. The lines are closely drawn, and we are all happy except for an occasional raid made by an ambitious competitor, but he soon subsides when he finds his work is ineffectual.

It is not beyond the remembrance of many Hardware jobbers when the headquarters and base of their supplies was in the East, but by the inexorable laws of nature they have moved to the West. Is it not possible that this march will still continue, and that the present conditions existing is the East may mark the future end of the present rush and inflation in the West?

The maintenance of prices is dependent on a feeling of confidence. Sometimes this is fickle and changes suddenly. At the present time some prices are abnormally high, but generally staple goods are held in strong hands who will maintain a firm and regular market for the spring at least.

The market on Wire products has been a little mixed, but is much stronger and advances are in order. Orders for spring goods are very satisfactory, and shipments are being made early to guard against delays on the railroad which mean lots of trouble a little later.

The orders for Bicycles are far in advance of the past two years. The demand is largely for the cheaper grade machines. There is nothing in view at present that will prevent a large and profitable business for the coming new year.

Louisville.

W. B. Belknap & Co.—The departure of the old year finds us keen with expectation for the new and with all energies employed in anticipation of full days in early January. The demands from the country at large never seemed so great and prosperity never better assured. This does not mean necessarily that prices for commodities and securities are going to be maintained at record breaking figures, but that there will be ample employment at good wages for any one who is willing to put hand to Plow, Shovel, Trowel, Plane or Pick and for whoever will exercise his brain to its legitimate capacity.

In spite of the enormous immigration which must supply the simpler forms of labor, there is a good demand in the higher strata for all who can offer intelligent and diligent services; and many such there are who are but a single generation removed from ancestry which sat upon its pack at Castle Garden.

All sorts of construction are pressing, and development seems to be the order of the day. The railroads have set the pace by ordering heavily supplies for the coming year. If there were two or three more locomotive factories in the country they could be well employed.

All of the accidents lately in this region seem to have been particularly fatal to locomotives, just when motive power was most urgently needed by the railroads to handle freight and passengers. It looks as though it would take several years for us to catch up with our needed supplies in this line. Along with this great demand for necessities comes luxurious living for those who have made fortunes by the sudden appreciation of their securities or real estate properties or manufacturing plants. This was plainly evidenced in the character of Christmas shopping, higher grades of goods being sold in this market than ever before and in much larger quantities.

Altogether, the outlook is most promising, and we have only to maintain a good firm hand at the national helm to have the ship of State ride the waves boldly with all canvas spread.

Baltimore.

CARLIN & FULTON.—Another 12 months have tested not only the theories, resolutions and the prophecies with which the year 1902 was ushered in, but also the practicability and the wisdom of many of the changes in business methods and operations, which by some are attributed to natural evolution and therefore inevitable, but by many others to causes which are tolerated rather than approved by an over ruling Providence.

It is hardly within the scope of this letter to take up economic questions which are engaging the consideration of every thoughtful mind throughout our country, as well as abroad, but as the iron and steel industries seem to dominate the world's commercial interests, and also to be the greatest field for the experiment of consolidation, trust or combination, we may be pardoned for hurriedly alluding to them.

It is rare that great power is not accompanied by the desire to avail of its advantages, and looking forward to the possibility of future loss, make the most of its opportunities. This is the rock on which most of the greatest organizations in trade are wrecked, and it requires skillful hands to avoid the disaster which seems common to all whose ambitions are greater than their judgment.

The year just ended has seen competition so keen, so threatening, so influential, that some of the greatest staples in the trade, on the production of which have been based the greatest consolidations of this or any other age, have been forced to recede from the arbitrary values which had been placed upon them and reduced to figures more in accord with the public demands and sound business policy. In this connection it is useless to mention names, as the trade is familiar with them.

Now, on the other hand, it is also well known that the competition just referred to, which has forced a lower level for some commodities, will for the year 1903 be almost eliminated, and some reaction may be naturally expected, though prices may not rise to the figures to which they had been unwisely forced.

A survey of the field for the coming year's business shows from our point of view a pleasing prospect. Labor has been and is now generally well employed, excepting where strikes have created voluntary idleness. Wages have been generally satisfactory, though the higher cost of living offsets considerably the advances given. Agricultural products have brought large returns to the farming community and generally at satisfactory prices.

The immense concentrations of capital, though bearing heavily on many an individual, have enabled large corporations and municipalities to undertake gigantic operations, the magnitude of which seem fabulous and would be beyond the the abilities of any smaller concerns to handle. The requirements of these great enterprises, whether in tunneling the Hudson or in crossing the Isthmus, in the construction of new bridges, the relaying of thousands upon thousands of new rails, the building of new cars and locomotives, added to the current daily consumption of the individual throughout the land will give employment to thousands upon thousands, from the unskilled day laborer to the highest type of skilled mechanic.

Now if Congress will but act with wisdom, disregarding political bias, and provide for the legitimate requirements of the business interests in the way of finance, we may confidently look forward to another year of business prosperity.

Cleveland.

THE W. BINGHAM COMPANY.—With us the Hardware trade in all our different branches, mining, milling, manufacturing and general Hardware, continues good. There seems to be no let up in the demand, even though we are approaching the end of the year.

Christmas with all its good cheer has come and gone, and as we approach the end of the year we can say truly that we do so with light hearts and pleasant recollections of a good trade (thanks to our customers) throughout the past year. Each month's trade seems to have taken care of itself in good shape as against the same months in last year, and we shall round up the Hardware business in this section with a feeling of contentment.

Throughout the year there have not been many radical changes in prices in the different lines of goods, prices for the most part being steady in most lines, and merchants having been willing to buy almost all lines of goods freely, feeling assured that they were safe in so doing. Although competition has been fierce and profits have been scaled down, still we will round up the year quite satisfactorily, and we look forward with high hopes for a larger business in 1903 than has come to us in the year past. We say this with confidence, for everything points that way.

Our orders for future goods—that is, season goods to be shipped in the first three or four months in 1903—are larger than heretofore, showing that retail merchants realize the fact that if they do not get their orders in early they will be disappointed by not having the goods when their customers want them.

On the whole the outlook is very encouraging, and we believe that a happy and prosperous new year will come to all of us, and we extend the compliments of the season to all of our friends in the trade.

Philadelphia.

SUPPLEE HARDWARE COMPANY.—At about the time this issue of *The Iron Age* is being mailed to its many thousand readers the ever memorable year of 1902 will have gone into the depths of the past, and while to the very young or the aged and infirm it may seem little more than the passing of events; yet on December 31, when the sun goes down beyond the horizon and when the many thousands of bells in this great land have rung out the old year and have chimed in the new, when the many thousands and thousands of voices from the throats of as many people have ceased and when stillness prevails, you will find recorded that the most prosperous year this country has ever known has passed.

If we may judge the country from what we have seen in our own city, the Christmas holidays have brought more gladness to the hearts of many than ever before. The retail trade has been exceedingly active, the many large department stores have done a business in excess of the most sanguine anticipations and beyond what imagination could suggest, the many small retail stores have come in for a fair proportion of the trade, the stores have been crowded from early in the morning until late at night and the streets have been crowded to an extent that cars have been blocked and many persons have been compelled to wait far into the night before reaching their homes. Millions and millions of dollars have been spent in gifts, and to a witness of it all it would seem but little less than a fairy scene, and it would almost seem that a lavish and reckless expenditure of money had been indulged in. On Christmas day some 5000 newsboys were presented with Christmas dinners in three of the largest rooms in our city, each of them containing some 1500 persons, and in all some 12,000 persons were provided with their Christmas dinner in this manner. Thousands upon thousands of turkeys were donated to other families and thousands upon thousands of children were presented with toys by systematic organizations; and at a low estimate perhaps $20,-

000,000 in money was given away in this manner by those quite able to do it in our own city. What does it all mean? It means there has been prosperity with those in trade; it means steady work and good wages to the many thousands and thousands of persons who have been employed throughout our country during the past year.

One would scarcely know where to begin or where to end were he to attempt the difficult task of enumerating the many changes that have taken place or the many results which cause our prosperity, clouded as some of them may be from causes perhaps always incidental to prosperity. Prominent before us is one, the coal strike, which lasted for many months and which caused a scarcity of coal which must be felt by all during the entire winter, and which in many cases might have caused great suffering in our own city, as well as others, had it not been for the assistance of benevolent persons, who are now so liberally contributing to those who are less able to pay the exorbitant price of coal. Nor has the coal strike been the only one that has caused a scarcity of goods as well as made necessary occasional advances in our manufactured products. It is one of the dark spots in our otherwise harmonious and united country that it is not possible always to settle these matters by arbitration in such a manner as to result to the satisfaction of the wage earner and yet not be hazardous to the employer.

The enormously large aggregation of capital which during the last year has joined hands with the year previous in absorbing a number of industries, which has caused uneasiness in the minds of many individuals, has two sides to the question at issue. Undoubtedly enlarged, if not almost unlimited, capital at the command of either gigantic or even less formidable combinations will enable them to extend their trade into foreign countries, where restricted capital could not reach single handed, it being an expensive matter to penetrate to the ends of the world with your trade unless you have the capital to do it. There are, however, dangers in overloaded capitalization that could not be enumerated in this short space. Prominent before us is a recent incident where innocent holders of stock from a quick depression lost in the aggregate millions of dollars from a drop of stock in a few days from $30 to $6 per share. However, it is a trite saying, which might be observed for the present and near future, that "when the eagle is on the wing let birds of lighter feather keep their nests."

The increased trade during the past year has overloaded the capacity of the railroads in providing sufficient cars for quick transportation of goods, the effect of which has not been confined to any one section. Possibly in the shipment of merchandise Philadelphia and New York City have suffered less for quick transportation than other locations from the fact that the products of the farm for export must come to the seaboard for transportation abroad, and owing to our large crops, especially throughout the West, and especially so in corn, the farmers have had more than the usual amount to dispose of, which fortunately for them brings good prices, and this, together with the last two years, will place most of them in a very comfortable position. The same thing exists throughout the South, and not only cotton, but other products have been significantly large. Manufacturers' exports also come to the seaboard ports for shipment abroad, and when cars reach our city they must be immediately returned and reach their destination as quickly as possible. Nevertheless both of these cities have also suffered from scarcity of cars. It has been flippantly stated that during the past year new transportation cars have been built—not referring to weight or capacity—in quantities, as if they were Christmas toys, and it is given out that not less than 175,000 new cars have been built and handed over to the railroads of the country, and still the scarcity exists. We must not, however, overlook the fact that some 6000 miles of railroad have been constructed during the past year and that 25,000 to 35,000 new engines have been furnished.

Our extended trade during the past year has outgrown our circulation medium, and while the system of exchange is much aided by payments in checks, yet the currency of the country is entirely inadequate for our requirements. For some system to overcome this we are dependent upon the unfortunately slow process of Congressmen, many of whom may not appreciate the speedy requirement.

We see no cloud in the horizon which would cause us to be pessimistic in regard to trade for the coming year, but there is every reason so far as we can see for a continuation of good trade for the year 1903. And in our own particular line of Hardware and its correlatives, and especially those lines that are dependent upon heavy goods, there must be a scarcity of material, owing to the continued large construction of the railroads in engines, car building and the large structural iron for the present style of building and other heavy goods used in construction. This must make base material scarce and continue high.

It is a matter of great congratulation to our country that every man, woman or child who desires employment can easily obtain it and at a remuneration far in excess of that paid in any other country. In comparison with the many out of employment in England, Germany and other foreign countries, while we should all sympathize with them we cannot help but congratulate ourselves that we live in a country which at the present time is so prosperous and has made such rapid advances during the last few years in manufacturing and mercantile industries.

We wish all the readers of *The Iron Age* the compliments of the season and a happy and prosperous New Year.

St. Paul.

FARWELL, OZMUN, KIRK & CO.—Nineteen hundred and two closes with a record as to volume of business ahead of any previous year. Doubtless also the margin of profit with most Hardware houses has been fully up to that of average years, while there have been exceptional years in which larger profits have been secured.

No complaint certainly can be made on the volume of business or the steady demand for goods. It is really astonishing that the consumption of goods has kept up without intermission throughout the past four years and with the prospect ahead for its continuance.

There will be some sections that will doubtless find trade not quite so active, through local causes, but generally the conditions are favorable and spring trade promises to be quite satisfactory.

There has been but little speculative buying of goods in the past year, either by the wholesale or retail dealers. Purchases have been confined to the requirements of the trade, and the new year opens with stocks in normal condition and the retail trade will be required to buy for actual consumption, which promises to make a steady, legitimate demand for goods.

Prices have been more than usually steady throughout the year—fewer advances and declines than we often see in 12 months—and the balance sheets of January 1 will show as little difference as is often found in results from the effect of advances and declines. Indeed, we think that merchants who take their present inventory on the actual values of the goods to-day may feel that their year's business shows what they have done on a level market, and they may safely determine from it as to the policy that must govern in the new year.

There is nothing now to be seen that would lead the retail trade to reduce stocks below their present condition. Full but not excessive stocks will be the rule, and every progressive, down to date merchant will be prepared for his trade to as full an extent as ever before. The only exception will be the dealer who has to consider adverse local conditions.

Collections have not been quite up to expectations. The principal cause of this we believe to be speculation in farm lands, which has diverted millions of dollars from the usual channels. This craze has probably reached its highest point. If so things will adjust themselves gradually and without too severe a jar to the financial interests of the country. But if speculation goes on and increases in intensity somebody will get hurt and the number of victims will be legion.

Nashville.

GRAY & DUDLEY HARDWARE COMPANY.—As the traveling men are now in from their respective territories business is practically suspended for the holiday celebration.

A review of trade conditions in this locality for the past 12 months would merely be a repetition of what most of our letters have been—namely, that trade is good, the demand for goods excellent and the market firm.

The year is drawing to a close without any of the demoralization which usually occurs in November and December. Manufacturers, jobbers and retailers all seem to have about as much business as they care to handle. As we enter 1903 with a very firm market on staple goods and a strong demand, we see no reason why the jobbers should not realize a good profit.

In this locality on January 1 stocks are, or should be, complete for the spring trade. The retail trade has been good during the fall months and close investigation leads us to believe that the retailers' stocks are not heavy. A good crop has been made throughout the country and fair prices realized. There are more improvements of various kinds under contract in the South at present than at any time in the past. With this view of the situation we can but believe that 1903 will prove to be a satisfactory year to the Hardware trade.

We certainly wish the readers of *The Iron Age* prosperity and happiness in 1903.

Portland, Oregon.

CORBETT, FAILING & ROBERTSON.—The year now drawing to a close has its prototype only in that of 1892. Now, as then, the country was never more prosperous in its history on paper. True, we surpass 1892 in the amount of paper that has been foisted on suckers from Portland, Me., to Portland, Ore. But if they had not been taken in by the industrials they would have been caught in real estate, mining shares or some other fool investment. The bankers' pool, so lately made up of the people's money, as many have subscribed more than their capital stock, will prove but a temporary makeshift.

November exports, $24,000,000 less than November, 1901, speak eloquently, if not hopefully, of the days of wrath in store for us. Exports decrease, imports increase, balance $500,000,000 against us by July 1, 1903; the folly of maintaining values at abnormal figures will be apparent when too late.

Above comments might be said not to bear on the Hardware situation. We wish they did not, but they will by reflection. Conditions in England and Germany only foreshadow what we will be up against in iron and steel.

This is not from a pessimist, as the last six years have brought us nothing we have to compain of, and United States Steel has treated us in four of its departments as well as ever independent manufacturers in the same line have. But it is reasoning from cause to effect.

Trade in Washington and Oregon never was better in December than this year, and prospects are bright for the new year. Money—there is lots of it belonging to the people, but it is largely on deposit in New York and not in the people's name. Can they get it when they want it?

NOTES ON PRICES.

Wire Nails.—The market has been quite active during the week, owing to orders carload buyers have been sending in for shipment before January 1. This activity is ascribed to a general feeling among the trade that Nails will be no lower and that they may possibly be higher. The new freight rates going into effect the first of the year will increase the delivery price. Quotations are as follows:

Jobbers, carload lots	$1.85
Retailers, carload lots	1.90
Retailers, less than carloads	2.00

New York.—The local market is quiet, buying being on a limited scale. Much difficulty is experienced in getting Nails, owing to long delays in transit. Quotations are as follows: Single carloads, $2.05; small lots from store, $2.10.

Chicago, by Telegraph.—Conditions previously referred to have continued during the last week of the year. Manufacturers have been so overwhelmed with orders that they have discouraged new business as much as possible. Even the jobbing trade has continued very fair in the face of inventory, and the market has ruled firm at full prices. Official quotations have continued at $2 in carload lots, mill shipment, and $2.10 in less than carload lots, all f.o.b. Chicago.

St. Louis, by Telegraph.—Jobbers report considerable activity in the demand for Wire Nails the past week, and prices rule very steady. In small lots from stock $2.15 is asked.

Pittsburgh.—The year closes with a satisfactory demand for Wire Nails and the tone of the market is fairly steady. The large interests are adhering rigidly to fixed prices, and any slight concessions that are being made are by smaller mills. Jobbers are placing contracts earlier than usual, anticipating some delay in getting deliveries when wanted. We quote Wire Nails at $1.85 in carloads to jobbers, $1.90 in carloads to retailers and $2 in small lots, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days. For galvanizing Nails 75 cents per keg is charged, and for tinning Nails $1.50 per keg extra.

Cut Nails.—Mills are making shipments slowly, and stocks are referred to as being generally low. The congested condition of the railroads adds to the delay in receiving shipments. Quotations are as follows: $2.05, base, in carloads, and $2.10 in less than carloads, f.o.b. Pittsburgh, plus freight in Tube Rate Book to point of destination; terms 60 days, less 2 per cent. off in 10 days.

New York.—While demand is light, there are some sizes of which the local market is practically bare. This is on account of delays of carloads in transit. Quotations for carloads and less than carloads are as follows:

Carloads on dock	$2.18
Less than carloads on dock	2.23
Small lots from store	2.30

Chicago, by Telegraph.—There has been but a moderate volume of business, but the market has continued firm, with sales made on the basis of $2.15 in carload lots and $2.20 to $2.25 in less than carload lots for Steel, Chicago. Iron Nails are sold on the basis of $2.30 in jobbing lots from store, Chicago.

St. Louis, by Telegraph.—Very fair demand for Cut Nails continues, and the prevailing quotation among the jobbers is $2.25 in small lots from store.

Pittsburgh.—The market is firm and is characterized by a continued scarcity of Iron Cut Nails. Demand for Steel Cut Nails is fair, but shipments are delayed somewhat owing to the congested condition of the railroads. There is no change in prices and we quote Steel Cut Nails as follows: $2.05, base, in carloads and $2.10 in less than carloads, plus freight in Tube Rate Book to point of destination, terms 60 days, less 2 per cent. off in 10 days.

Barb Wire.—There is a moderate demand for Barb Wire during the holiday season. The outlook for spring business in this line is encouraging. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

	Painted.	Galv.
Jobbers, carload lots	$2.15	$2.45
Retailers, carload lots	2.20	2.50
Retailers, less than carload lots	2.30	2.60

Chicago, by Telegraph.—The tonnage booked has been very heavy, orders for shipment to the West being especially large. The difficulty now is to make deliveries. All manufacturers are heavily sold and are disposed to discourage business for early shipment. Official quotations for Galvanized are $2.60 for carload lots and $2.70 for less than carload lots, Chicago. There is a good de-

mand for Staples and the market remains firm at $2.05 in carload lots and $2.15 in less than carload lots.

St. Louis, by Telegraph.—The early demand and inquiry for Barb Wire shows improvement, and it is expected that the spring demand will be in heavy volume, and preparations are being made with this idea in view. In small lots from store jobbers quote Painted at $2.45 and Galvanized at $2.75.

Pittsburgh.—A fair volume of new business is being placed, mostly from the West, and indications for spring trade are good. Prices are firm, there being almost an entire absence of cutting. We quote as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. off for cash in 10 days: Painted, $2.15; Galvanized, $2.45, in carload lots to jobbers; Painted, $2.20; Galvanized, $2.50, in carloads to retailers; Painted, $2.30; Galvanized, $2.60, in small lots to retailers.

Plain Wire.—A strong tone prevails in the market, with prices unchanged.

Chicago, by Telegraph.—Both new business and specifications on old contracts have been very heavy. Shipments have been large and orders for the future running into the first quarter of the year are without precedent. A number of independent manufacturers have sold their full capacity for several months to come. Prices have remained firm, as follows: Nos. 6 to 9 in carload lots are quoted at $1.90 on track and $2 from store; Galvanized is selling at 30 cents extra for Nos. 4 to 14, spot.

St. Louis, by Telegraph.—The jobbers report a continuance of the moderate demand. No. 9 is quoted at $2.05 and Galvanized at $2.35 in small lots from store.

Pittsburgh.—We note a fair demand and prices ruling strong, being firmly held by the larger interests. There is still some delay in getting shipments on account of congested condition of the railroads. We quote: Plain Wire, $1.75, base, for Nos. 6 to 9, in carloads to jobbers, $1.80 in carloads to retailers and $1.90 in small lots to retailers; Galvanized, 30 cents extra for Nos. 6 to 14 and 60 cents extra for Nos. 15 and 16.

Henry Disston & Sons.—Under date January 1, 1903, Henry Disston & Sons, Philadelphia, issue their discount sheet applying to the catalogue, January, 1902, giving substantially the same discounts as have been in force during the year. The factory rate beyond the printed discount, pages 10 to 66, inclusive, will be 10 per cent., and on pages 67 to 177, inclusive, 7½ per cent., and the request is made that the trade strictly maintain these prices. The discount sheet is accompanied with revised list prices on Plumbs and Levels, Try Square No. 1, Solid Tooth Circular Saws, Shingle Saws, Resawing or Siding Saws and a few other special Saws.

Cordage.—Demand for Rope is light, with no important market changes. Manila Rope is quoted, on the basis of 7-16 inch and larger, at 11 to 11½ cents per pound. Sisal Rope, on the same basis, is quoted at 7¾ to 9½ cents, the latter quotations representing quality.

Glass.—The market is bare of interesting features. Manufacturers are preparing to ship Glass as soon as the jobbers' association members send in specifications. With the market in a more satisfactory condition, buyers will have increased confidence in placing orders according to their requirements. Discounts from the December 16, 1902, list are as follows:

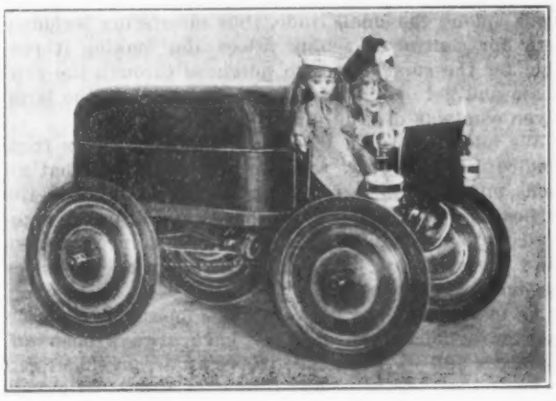
Small lots from store.....90 and 10 %
Carloads, f.o.b. factory.....90 and 20 and 2½ %

Oils.—*Linseed Oil.*—Immediate requirements are light, with practically nothing doing in this line. Futures can be purchased at quotations for current lots, but buyers are not anticipating their requirements. The market is firm at the following quotations: City Raw, according to quantity, from 46 cents per gallon; State and Western brands, 45 cents per gallon.

Spirits Turpentine.—The local market is firm on advices of a strong feeling at the South. Demand is light and is not expected to increase to any extent for a week or more. Quotations, according to quantity, are as follows: Southerns, 55 to 55½ cents; Machine Made Barrels, 55½ to 56 cents per gallon.

AN AUTOMOBILE IN THE WINDOW.

A CLEVER window display of a miniature automobile was recently made by N. H. Le Clear, Waukesha, Wis., as shown in the illustration. The body of the vehicle was made of one of Sidney Shepard & Co.'s Savory Roasters. The seat and dash board were of tin. The wheels, which were Kettle covers, were fastened to axles composed of 1-inch Tin Tubing; ¾-inch Rubber Tubing was placed around the wheels and served as Tires. Small Night Lamps were placed on each side of the dash board to represent the carriage Lamps. An electric Bell served for the gong. The levers and steering wheels were made of Wire and the Gear Wheels of Cooky Cutters. Brass Plumbers' Chain was used for the Sprocket Chain. Two dolls were placed on the seat, as shown. The automobile was represented as on a country road; the grass at the side of the road was excelsior colored green, and the road itself was made of sand and small stones. The background was piled with Savory Roasters, the advertising of which was the object of the display.



An Automobile in the Window.

GRAY & DUDLEY HARDWARE COMPANY'S BANQUET.

THE eighth annual banquet of the Gray & Dudley Hardware Company, Nashville, Tenn., was given at the Duncan Hotel in that city on Friday evening, 26th ult. More than 200 persons participated, including house employees, office men, traveling salesmen, heads of departments and officials of the company. It was in marked contrast to the first banquet, eight years ago, when those present numbered just 23. Robert M. Dudley, president of the company, acted as master of ceremonies. After disposing of an elaborate *menu*, Mr. Dudley called on John M. Gray, Jr., vice-president, who directed attention to some interesting facts concerning the company's business. Among other things Mr. Gray stated that the percentage of increase in their business during 1902 was greater than any previous year, although the company's trade has shown a constant expansion year by year since their establishment. Forty-five traveling men are employed, and it has been decided to put eight additional men on the road at an early date. The new men will be placed in Arkansas, Mississippi, Louisiana and Texas. It has also been determined to open a branch establishment in Memphis. At the conclusion of Mr. Gray's address Mr. Dudley announced the winners of prizes offered by the company for the best suggestions made by employees. Then followed addresses by the following employees in response to toasts: W. C. Pollard, W. H. Buchanan, Geo. W. Everett, W. C. Nimmo, R. M. Kellogg, F. L. Martin, W. H. Fickling, Samuel Shannon, J. G. Boyles, John M. Pickard, Marvin Mabry, Henry T. Hill and W. R. Medearis.

John Gannon has bought out his partner in the Hardware and Farm Machinery business at Montgomery, Minn., and continues under his own name.

SYNDICATE BUYING.

In view of the attention which Syndicate Buying is attracting in the trade, the following letters will be of interest. They are nearly all from prominent manufacturers with well established trade, and indicate the manner in which the system is regarded by them, with suggestions as to how evils connected with it may be avoided. Other manufacturers who are glad to avail themselves of the services of the Syndicate Buyers in marketing their goods are naturally more reserved in discussing the subject, as are the jobbers who directly support the system:

From Eastern Manufacturers:

We made no objection to the plan of syndicate buying until those buyers endeavored to purchase our goods in their own name and have them billed to and settled for by the parties making out the orders. In this way the syndicate buyers had the option of dividing the goods among the small trade, thus interfering seriously with our control of selling prices and making it possible for the small buyer to purchase through the syndicate and get our goods at a lower cost than the large buyer who was dealing direct with us.

We adopted a plan whereby we accept orders from syndicate buyers only with the understanding that all goods must be billed, settled and shipped direct to the parties for whom they are purchased and at prices regulated by ourselves. Under no circumstances do we allow the syndicate buyer any rebate beyond the prices the purchaser settles for.

As to the relations between the Jobbers' Association and the syndicate buyer, they have always been antagonistic and we fail to see where an arrangement can be made that will be of any benefit to either. It is presumed that the syndicate buyer will submit lists of their clients to the Jobbers' Association, who will indicate which customers they think should purchase goods through a syndicate. What is to prevent a syndicate buyer from opening an office in an adjoining room under another name and taking in all the business the association does not countenance and thereby selling to whoever he sees fit? It would be very easy for the syndicate buyers to post themselves as to current prices the same as they do to-day. They could own 51 per cent. of the stock in some Southern jobbing house, thereby controlling that business, and could get all their prices by having this house write the different manufacturers for quotations.

In my opinion the only way to prevent a syndicate buyer from doing injury to both the manufacturer and jobber is to ship and charge no goods direct to them, but to make all settlements direct with parties to whom the goods are shipped. We have found this plan to work very satisfactorily in our business for some time past.

From Western Manufacturers:

My opinion of syndicate buying is that it will not be done away with so long as there are men of ability who will act in the capacity of buyer, and so long as they are patronized by either jobbers or retailers, unless and except sellers decline to sell to or through them. Not only do retailers, but there are large jobbers also who work through syndicate buyers. It is true these syndicate buyers have different methods. Some openly state who they want the goods for and act in the capacity of buyer for strictly wholesale houses; others claim to occupy a similar position, but do in fact represent most largely or are employed most largely by retail houses. They may be retailers of good repute; prompt pay and liberal buyers, as retailers go, but they are retailers, nevertheless.

The occupation of a syndicate buyer is a legitimate one, and it is perfectly proper for any merchant, wholesale or retail, to employ one. It is largely a question of whether it is good policy, and particularly a question of whether the methods of one or all of these gentlemen are acceptable to those of whom they make inquiry for prices.

A manufacturer with ability to manage his factory affairs, possibly making a patented article or only a small quantity of goods, but having neither traveling men nor knowledge of how to market his goods, can use the syndicate buyer to good advantage.

Manufacturers of magnitude, well established, with a good trade with the jobbers, cannot in fairness to their customers make quotations to or through syndicate buyers who are representing retail concerns. Where a manufacturer sells his product through the legitimate jobbing trade he should protect that trade—not, directly or indirectly, through syndicate buyers, enter into competition with his customers by selling the retailers.

From a Prominent Jobbing House:

Of late, owing to the growth of so-called trusts, there has been a great deal said, mostly by way of eulogy and regret, upon the passing of "individualism" in business, and yet it is probable that many who have joined this chorus of regret have altogether failed to realize that syndicate buying has been quite a factor in bringing about this apparently undesirable state of affairs. The old way of doing business, in which each house stood on its own merits and had a distinct policy of its own and made its own bargains with manufacturers, has been lately more and more a thing of the past, and this has somewhat tended to eliminate individualism. Formerly each house had a distinct character and reputation of its own and was recognized by manufacturers as an individual, and all business was transacted on a personal basis. Under this plan there were large and small buyers, prompt and slow payers, and some were satisfactory and others unsatisfactory customers from the manufacturing standpoint, and manufacturers being human were apt to appreciate this point in dealing with houses which combined the qualities of prompt payment, liberal purchases and satisfactory methods. Syndicate buying, however, has done much to efface a relative difference between various houses and reduce all to the same class.

The manufacturer in dealing with syndicate buyers is usually unaware whether he is dealing with Brace, Bit & Co. or with Axe & Pick Hardware Company. Quotations are made in a mass, and the only satisfaction the syndicate customer has is in believing that he is buying as cheaply as his neighbor. The syndicate customer likes to think by reason of his syndicate member, ship he is buying goods at lower prices than his competitors, but if he stops to think that this very fact forces his competitor to join a rival syndicate he can see very clearly that instead of being in pocket by it he is out the amount paid out in salary to the syndicate buyer.

Again, the unfairness of syndicate buying is seen when it is realized that all the members of the syndicate are not of the same size and buying capacity. In many cases large and very small buyers are on the same syndicate list, and then the large buyer is distinctly at a disadvantage, as he is probably saving little or nothing by his syndicate membership, while on the other hand he is simply enabling his smaller fellow members of the syndicate to take advantage of his own buying capacity and obtain the same prices from manufacturers.

Realizing these points, we have always felt that syndicate buying was a menace to the trade and have never countenanced it in any way, believing that the house which tries to do business as an individual and maintains its individuality with both the trade and manufacturers is in a position oftentimes to obtain favors which cannot be granted to syndicate buyers.

From Manufacturers in Massachusetts:

In our opinion syndicate buyers are the biggest nuisance in the business. They spoil good markets by making quotations on single dozens and extremely small orders that are as low as we can afford to sell a large quantity for. They habitually cut everybody's throat for the sake of making a sale. Price is the only thing that they know how to talk. They never sell an article on its merit. They never sell an article that is high in price if they can sell a substitute that is lower in price. They never make new trade except on price terms. If a concern is making a new article the syndicate houses will not help it in sales, no matter what the merit

of the goods. They sell orders in quantities which are so small that they require special cases and special packing, on which a concern will not get back its money. They are extremely slow in payments, unless the selling house takes the bit in its teeth and pushes ahead regardless of protest. These houses seem to use every little excuse that it is possible to make to delay payment or to avoid just charges for packing or cartage. They are the worst offenders in the matter of overrun discount periods. They abuse every tenet of business law if such abuse will give them an added profit. These things are all against the interests of selling firms.

We have not sold a syndicate house as a syndicate house for a long period. We make our price direct to the buyer and insist upon the buyer sending us money for the goods. The syndicate agencies may handle the order if they see fit, but the buyer gets the discount which he is entitled to and he knows that we, personally, are looking after his interests. We send the syndicate houses a duplicate bill if they require it, but the customer gets a bill which is identical and the syndicate is not able to pinch a little more profit out of the sale. We had numerous instances where this was done previous to our refusal to bill goods to them instead of the purchaser.

We are threatened by all the syndicate houses with loss of trade. We have lost trade in small accounts, but we have gained it in large accounts; for this reason, the small account business had no weight. The large houses felt hurt at sales in their territory through syndicates made at bottom discount and consequently they did not push our goods. To-day we are not selling the syndicates. The large houses are working for our interests. Our business is better than ever. Our accounts are paid promptly. Discounts are strictly looked after and we have no complaint of sales to small houses at ultimate discounts. We stand personally responsible to our large customers for the quality of the material we sell, and we think that we have made a step forward as well as saved ourselves much worry.

If the Jobbers' Association can drive the syndicate system into some sort of shape it will be the best thing that can happen. The system in itself is all right, but its abuses make it an abomination. We trust that this will give you our opinion from actual experience with both methods.

From Connecticut Manufacturers:

We have for years made more or less acquaintance with the individual syndicate buyers, some of whom we personally esteem highly, but have never hesitated to express to them whenever the subject of prices was discussed our belief that they were the greatest demoralizers of prices in the market and that a great majority of them did not in the least consider the quality nor did they care particularly whether goods were as represented or not, and we refused to quote them.

We have also written firms who were represented by them (syndicate buyers) in New York that whenever they were ready to buy our goods direct we would be pleased to make them our best prices, and to-day we believe we are selling direct four-fifths of the large firms who handle goods of our manufacture and who have buyers in New York, and we are not interested in any revision of customers suggested by the Jobbers' Association with syndicate buyers.

From Manufacturers in Ohio:

We have never approved the policy of the manufacturers making special prices to syndicate buyers and we do not think that such a practice is fair to the larger jobbing trade of the country. We believe as a rule that the syndicate buyer buys most of his material for the retail trade, men who would not be considered strictly jobbers. By getting concessions from manufacturers for quantity the smaller jobbers, if it is fair to call them so, and the larger retail dealers are able to buy as cheap as or cheaper than the legitimate jobber, and I believe that this works out as against the jobber. Furthermore, it is a bad policy for the manufacturer, because the syndicate buyer is looking only for price, and if he is encouraged by special prices to build up a large *clientele* among the Hardware people the manufacturer does not come in contact with these Hardware people, and if he cannot continue to make a price satisfactory to the syndicate buyer he loses the entire trade by losing one customer.

It has always been our policy to deal directly with the Hardware dealer, believing that five or ten Hardware dealers are better customers for us than the same number of men buying through the syndicate buyer, as we become acquainted with each individual house and it is much more difficult for a competitor to switch them away from you, even on a question of price, where there is a personal acquaintance between the seller and buyer.

From Manufacturers in Illinois:

There is no question in my mind but that the syndicate buyer should revise something and that the jobbers should take a very active part in the revision, for they are certainly to blame for much of the damage which is done by the syndicate buyer. They caused him to live in the first place. They have cussed and discussed him ever since. They have used him as a club with which to pound the manufacturer.

We believe there is but one way for the manufacturer to handle the syndicate buyer—viz., require of him the name of the party to whom he wishes goods shipped, ship them and bill them direct.

We have built up our business by keeping everlastingly at it, and with the help of *The Iron Age* to tell the trade what we make, why we make it, how we make it and what we ask for it. We do not feel under any obligation to any syndicate buyer on earth.

From Manufacturers in New York State:

My views are possibly somewhat drastic, but I have no hesitancy in expressing them. I have always regarded the so-called syndicate buyer—to use an expression coined by a large jobber in the Middle West—as "a leech on the Hardware trade." That is, the system makes an extra class to get a living out of the business, and whose support must come from the manufacturer or the Hardware dealer, or both. The idea no doubt originated in the thought that a number of jobbers might, by "bunching" their purchases, secure a lower figure than in buying individually. Beyond that they think that the syndicate buyer "secures information" for them sufficient in value to warrant the salary which they pay him. To state the case frankly, the system is founded on an attempt to overreach the manufacturer. The latter, however, is the one who is responsible for its continuance. Thinking to get the trade of perhaps ten jobbers, where under ordinary circumstances he would sell possibly half of them, he makes an extreme cut price to the syndicate buyer, the result being, even if he secures the business, that he probably makes no more profit on it than he would if he had secured his natural portion of the trade at a little higher figure. The syndicate buyers have for years sought to encourage manufacturers to take up new lines so as to give them more sellers to pit against one another. Whenever a syndicate buyer is unable to "beat the market" on some particular line, he at once starts correspondence with manufacturers not making that line, urging them to go into it, and holding up the prospect and hope of large profits. The writer could show letters from syndicate buyers illustrative of this.

The natural fruition of the introduction of the system came when the retail dealers followed suit. Certainly, if it is proper and good business for eight jobbers in various parts of the country to combine and employ a syndicate buyer for the purposes set forth, it is exactly as legitimate for 50 or 100 retailers to do the same thing. A manufacturer well known to the trade writes me that it is the consensus of opinion that there are two classes of syndicate buyers, one of which is deemed to be legitimate, and the other, by inference, not. From my point of view I cannot draw the line between that which is legitimate in this system and that which is not. As I have stated above, if the system is a proper one for one class of buyers to employ, any other class is equally justified in using it.

The system might be easily broken up if the manufacturers or any large proportion of them would combine and agree upon two things:

1. Not to quote any syndicate buyer until he gave information as to where the goods, if ordered, were to be shipped.

2. Not to quote a syndicate buyer a lower price than would be quoted to his client. If, as indicated, any large proportion of the manufacturers adopted this rule, the syndicate buyer would be left with very slim picking and would soon cease to be a factor in the Hardware trade.

From Another Manufacturer in New York State:

We are very glad to note the work which is being undertaken by the National Hardware Association in connection with the subject of syndicate buying. From the standpoint of our business, whatever may be said on the general subject of syndicate buying, we are very strongly opposed to having the same syndicate purchase for both jobbers and retailers, giving the same prices to both. We feel that no one could favor such buying excepting the retailers themselves or others who are interested in seeing them purchase at jobbers' prices. We believe the jobber must still be recognized as a necessary factor in business, and so long as he receives this recognition he should be accorded a fair amount of protection at the hands of manufacturers.

From Manufacturers in Pennsylvania:

We will give you, in our own crude way, our views as to syndicate buying, which are not favorable to that method. Many years ago the syndicate buyer found out what the merchant paid for our goods and then laid his lines to get behind that price, so as to show the merchant that he could save him money by giving him his orders or paying him to buy for him. He would write us that if we would name a specially low figure he could buy such and such quantity and place our goods where we did not reach, &c.

Now we got caught at first and our position was, to say the least, very embarrassing and contradictory, as the sharp practice of the syndicate buyer made us come out always second best and sometimes left sores with our friends that we could not heal. A small house would be given the same price by the syndicate buyer as a large one, and if that house had done us a service by handling our goods they resented with some feeling the idea of buying our goods cheaper through a smart New York syndicate buyer than they could buy direct. Now we do not want to place all the blame on the syndicate buyer because we ought to have known better, but we arrived there by experience and now we scrutinize very closely all inquiries for price, &c., and if the inquiry is from a syndicate buyer we are free to say he does not get behind the scenes and receive rock bottom prices.

We as manufacturers do not think we are able for the syndicate buyer and consequently are content to let him and the other fellow fight it out on any lines they think best, but put us down as not favoring the distribution of our goods through them.

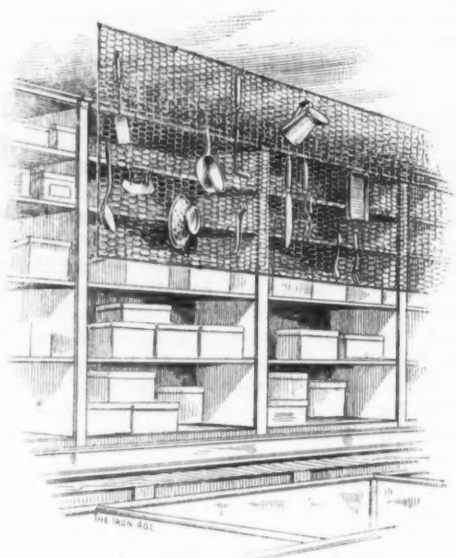
From a Large Jobbing House:

The methods of the managers of the various "club buyers" may differ in some particulars; so, also, may the value received for the amount paid for information be variously estimated by those who employ them.

There is one advantage which a jobber may either underestimate or overestimate, according to either his own experience or convictions. These large buyers of goods, especially those at a greater distance, may look upon it as an advantage in receiving from those employed quick information of either advances or declines, which in these days of vigorous competition may be of no small importance to them, while to the retail trade these matters are of comparatively insignificant importance beyond the hope that some salesman not yet posted by his house may not receive the information of advances which have taken place. This, however, is seldom likely to occur, as all well regulated jobbing houses keep in daily communication with their salesmen in matters of advances or declines, and in this particular we think almost any jobber would undertake for an equal remuneration in dollars and cents paid these buyers to furnish such customers as so desired with information of advances or declines. Buy why should any retail merchant reasonably expect to pick up goods in small quantities unless the seller had an equal remuneration to that paid to the "club" or syndicate buyers? In other words, the syndicate or "club" buyers furnish quotations for a certain remuneration, which a jobber does not receive, and in this manufacturers as well as jobbers are not infrequently embarrassed and both are frequently put in an unfortunate position.

DISPLAYING GOODS ON POULTRY NETTING.

SMALL articles and Tinware are displayed to very good advantage on Poultry Netting hung from the ceiling of the store of E. C. Sharpe Building & Lumber Company, Seymour, Conn. As shown in the accompanying illustration the Netting is fastened to the ceiling directly over the back of the showcases. This position gives the customers a good opportunity to see the goods displayed. A piece of Copper Wire 3 inches with a Hook bent on each end is used to fasten the articles to the Netting.



Displaying Goods on Poultry Netting.

A PAINT DISPLAY SUGGESTION.

A VALUED correspondent has suggested that when a merchant has a display of Paints in his window that he place upon the outside of the window a sign reading as is shown in the accompanying illustration. The idea of this is to make it look as closely like the sign a painter would put up immediately after painting a store front in which the word "out" has been scratched out and the word "in" placed above it.

A Paint Display Suggestion.

THE NATIONAL SWEEPER COMPANY, Marion, Ind., will make a display of their line of Sweepers in January at the Grand Rapids (Mich.) Exhibition. The display will be located on the first floor of the Shepard Block, as during the previous displays. The company expect to have a finer exhibit than on any former occasion.

THE HARDWARE MARKET IN 1902.

The Hardware Trade in General.

During the greater part of the year there has been difficulty in obtaining goods in sufficient quantity to meet the requirements of the trade in view of the heavy volume of current business. This condition in several lines continued even to the close of the year. Manufacturers certainly enter upon the new year with warehouses exceptionally bare of goods. Prices have been on the whole well maintained. In some lines they are lower, in others somewhat higher than at the opening of the year. There has been in nearly all departments of the trade a constant upward movement of wages and manufacturing costs, and the year ends with these influences in active operation, constituting an important feature in the situation.

Export Trade.

Although the export of American manufactured goods during the year 1902 will be considerably in excess of $400,000,000 in value, nevertheless it would have been far larger but for the great prosperity in the United States. Manufacturers of exportable merchandise have been overwhelmed with orders for home consumption; some of them have struggled manfully to care for their export trade, and have avoided advancing prices unreasonably. As a result, they will reap a large reward when the lean years come in domestic business. Others have been unable to care for the trade abroad. In some cases this was due to a short-sighted desire to look after trade that was nearest and with the details of which they were most familiar. In other cases it was due to the tremendous pressure put upon them by buyers in the United States. In many lines of business it has been a favor to get goods. But for these unfavorable conditions the export trade would have been many million dollars greater than it was.

Growing out of domestic prosperity arose another element which reduced the volume of export trade, the car shortage. In shipments abroad it is of much importance to have merchandise arrive so as to meet the ocean carrier, but it has been extremely difficult, even when goods could be purchased, to get them shipped.

There are innumerable lines of American manufactures which were introduced before the present era of high prices, with which foreign buyers became familiar. It was supposed that with the advanced prices here and with the bad financial conditions in Germany, that much of this trade would drift to our foreign competitors, but it is an interesting fact that where American goods have been well introduced and where the advances in prices have not been excessive, they have held their own. Their quality and convenience have outweighed the advantage of cheaper prices for the inferior articles. It would require but a slight additional recession in prices in the United States to greatly stimulate the export trade. It is by no means beyond the limits of possibility that within two years the United States should export $500,000,000 annually of manufactured merchandise.

Jobbing Consolidation.

During the early part of the year the project of a consolidation of Hardware and jobbing interests attracted the attention of the trade. The matter had been under consideration for more than a year and an active canvass of the leading jobbing houses had been progressing more or less quietly with a view to securing their adhesion to the plan. The promoters of the enterprise, which was to be on broader lines than any similar aggregation of the wholesale trade in Hardware or any other line, succeeded in obtaining options from a great number of establishments, and in a general way the plans seemed likely to be successfully consummated so far as the organizing of a great distributing company was concerned. A number of meetings were held and the matter finally reached such a point that after protracted conferences in New York City it was decided to make public the general features of the consolidation, the houses who were parties to it, the officers whom it was intended to elect, &c. This was done early in April. It became apparent, however, very soon that there was some indefiniteness in regard to their identification with the consolidation of some of the houses named, and there was at the same time a very general and frank consideration of the feasibility of the whole project. The result of this bringing of the enterprise out into the open air and into the midst of the realities of practical things, where it was obliged to stand on its own merits under the scrutiny of clear headed men, was to make it appear in the judgment of the manufacturers, the outside jobbers and the retail merchants an impracticable and, taken all in all, an unattractive proposition. The retailers disliked it and the manufacturers were afraid of it just in proportion as they believed it likely to be carried into effect. The only class outside the parties to the consolidation who regarded it with satisfaction were the independent jobbers, who looked upon it as promising to give them a magnificent opportunity. The result was the abandonment of the project by some who had been prominently instrumental in giving it form. Apart from whatever inside difficulties may have been encountered, there is little doubt that a conviction of the impracticability of the whole thing was forced upon them and that in the last analysis this was the reason for its abandonment.

Nails and Wire.

The history of the Nail and Wire trades in 1902 was a repetition of that of 1901. The demand in the first six months of the year was much better than in the last six months and the average of prices was higher. The year opened with Wire Nails selling at $2 in carload lots, Cut Nails at $2.05, Galvanized Barb Wire, $2.90; Painted Barb Wire, $2.60, and Plain Wire, $2.25. These prices were maintained through January, but at a meeting of the Wire Nail manufacturers, held in Chicago early in February, prices of Nails were advanced to $2.05, and Plain Wire to $2. At the same time manufacturers of Cut Nails reduced prices 10 cents a keg, to $1.95, base.

The market continued without special change until March, and early in that month the price of Cut Nails was advanced 5 cents a keg, to $2, base. Early in April the price of Cut Nails was again advanced 5 cents a keg, making the price $2.05, base. At this time there was considerable delay in getting deliveries of Nails and Wire on account of scarcity of steel. On April 30 the Cut Nail manufacturers adopted a new list of extras, which carried considerable advances on the smaller sizes. No special change occurred in the market until July, when, owing to the light demand for Wire and Wire Nails, a number of mills closed down. At this time the price of $2.05 for Wire Nails, and also prices on Wire, were being more or less shaded.

At a meeting of the Wire Nail manufacturers, held in Chicago, in August, it was decided to allow a rebate of 5 cents a keg to jobbers, but this rebate was generally allowed on all carload orders. The market continued in unsatisfactory shape, prices on both Wire and Wire Nails being more or less shaded, and on October 2 the American Steel & Wire Company announced a reduction of $4 a ton on Wire Nails, which brought the price down to $1.85 a keg in carload lots to jobbers. Prices of Barb Wire were cut about $7 a ton, which made the price of Galvanized $2.45 and Painted $2.15 in carloads to jobbers. Plain Wire was reduced to $1.75 in carloads to jobbers. These lower prices were met by the leading mills and continued in force until the close of the year. However, a number of small Wire and Nail mills that have to buy steel and rods in the open market were

unable to meet the new prices and closed down indefinitely.

In December the large Wire and Nail mills of the Sharon Steel Company, at Sharon, and the Union Steel Company, at Donora, were acquired by the United States Steel Corporation. This resulted in a more stable market, a good deal of keen competition having been removed. The outlook for the Wire and Nail trades for 1903 is regarded as fairly satisfactory. It is evident, however, that the capacity is larger than the consumption, unless an extraordinarily heavy demand should develop, and for this reason the Wire and Nail trades promise to be controlled by the well equipped mills that have their own steel and rod plants and are able to turn out product at a minimum cost.

Brass and Copper.

The Brass trade has been exceptionally flourishing during the year. The output has been unprecedented; in some instances factory sales being doubled. Prices were reduced December 4, 1902, from 35 per cent. discount on the list, including Sheets, Tubing, Rods and Wire, to 40 per cent., and prices are really not settled yet, the situation at present being still uncertain. Outside the great companies concessions have been made equivalent to 5 per cent. better on Sheet Brass, while Tubing is said to be obtainable at 10 per cent. or better, these figures applying to large quantities only. Many of the mills have been running night and day for months, and in many cases have been two to three months behind in deliveries. The mills shut down as usual Christmas Eve for the annual clean up, repairs and inventory, and will start up again January 2, 1903. It may not be amiss in this connection to draw attention to the fact that the recession in the price of Copper, an important constituent of Brass, has had not only an important effect on Brass products, but has interested architects all over the country to specify Copper for cornices instead of Iron, &c., the price, 16 and 17 cents a twelvemonth ago, now ranging from about 11⅝ to 11¾ cents per pound. An instance in point is the action of the Pennsylvania Railroad officials authorizing the covering of important train sheds with Sheet Copper instead of Iron, Tin, &c., while there is a tendency among manufacturers using Steel in small wares to go back to Brass and Copper.

The Rubber Goods Market.

Prices of Rubber Goods, as a rule, were well maintained during 1902. There has not been such an increase in demand during the year past as occurred during two or three years following the recovery from the last period of general depression in business, but a new level of demand and production has been reached which may be expected to continue. The buoyancy of the industry which succeeded the hard times led to the establishment of many new factories, with the result that the total capacity for making Mechanical Rubber Goods is now probably 25 per cent. in excess of the present demand. Yet some of the old concerns have been enlarging their factories of late and all hands look forward to a good business in 1903. Two or three years ago many factories had more orders than they could accept. The increase in factory capacity might have led to a reduced level of prices but for the fact that at no time have Rubber Goods been high priced in comparison with the cost of raw materials, and the further fact that many materials cost more now than a year ago. This is notably true of duck and other cotton fabrics which enter so largely into Rubber Belting, Packing and Hose. It is true that crude Rubber during most of 1902 was lower than for the two years preceding, but this was due in a large measure to a heavy failure in the importing trade in New York, which forced upon sale $2,000,000 or $3,000,000 worth of Rubber, unsettling the market conditions all over the world for some months. The year closed, however, with Rubber costing more than at the beginning of the year, with a still further advance expected. Low prices always cause a falling off in production, so that less Rubber is coming to market now and the recent advance cannot have an effect in stimulating production before the next crop season—months away yet.

WITH A STEADY DEMAND

for Rubber goods of every class manufacturers are busy, without the necessity of making concessions in price to secure orders. All raw materials are higher now than a year ago, while the visible supply of crude rubber is less. Added to this is the extra expense to which some factories have been put by the scarcity of coal in recent months. The cost of labor is also likely to be increased. A national organization of Rubber workers has been formed, though manufacturers seem agreed that the great diversity of work in a Rubber factory and the varying grades of pay will render impracticable such standardization as organized labor has imposed upon some industries. The largest Rubber factory in Chicago, however, is idle at this time, owing to differences between its owners and a local union, and precautions are being taken elsewhere against a similar condition. Rubber workers as a class are well paid and the tendency of wages for some time past has been upward, all of which conditions contribute to the maintenance of prices of Rubber Goods without the existence of a single organization of manufacturers for this purpose.

EXPANDING USE OF RUBBER.

The increase in use of Pneumatic Tools not only is calling for a great deal of Hose for their equipment, but specially prepared brands of extra strength are being made to meet the new demand. There is likewise a growing use of rubber conveying belts, in mining work, for example, in the manufacture of which great improvement has been made of late. More rubber is used every year in electrical work. While Gutta Percha remains the standard material abroad for insulating ocean cables, the United States Government has had made in this country, for use in the Philippine and Alaskan waters, some 2000 miles of cables insulated with Rubber, which points to a new direction for the use of Rubber in large quantities. The list of practically new uses of this material might be greatly extended, but enough has been said to show that, with the present means of supply, cheaper Rubber is not reasonably to be looked for, except spasmodically, and prices of Rubber goods must be governed accordingly.

The use of Rubber Tires on vehicles continues to expand, and is not likely ever to cease, if for no other reason than the great saving in wear and tear of the vehicles, through lessening jar. It seems now that Rubber Tires, properly made, may be fitted successfully to the heaviest vehicles. The tendency of Tire prices has been downward, in spite of the cost of materials, but a change in this respect may be looked for. It must be understood that few kinds of goods are made of "pure Rubber;" most articles are better made of "compound" with which has been incorporated materials to give the product some specially desired quality. There are other compounds, of course, the chief object of which is to lessen cost by displacing Rubber with cheaper materials. The purchaser of Carriage Tire stock by the pound cannot determine its value from its looks, but must await a test of durability. In the competition which has become more and more intense, carriage manufacturers have demanded Tire stock at constantly declining prices, and Rubber mills have been forced to meet these demands or forego business. It is probable that in the near future, however, the carriage trade, becoming better acquainted with the situation, will recognize the importance of supplying better Tires, and charging accordingly. Already there are Rubber mills turning out Tires of three distinct grades, as to quality and price, to accommodate different classes of trade—just as different priced Bicycle Tires are now sold side by side by the same dealer.

THE SALE OF SOLID RUBBER VEHICLE TIRES

is now so large as to render the supplying of steel channel for them an important item. At first a different channel section was needed for each make of Tires, but during the year the leading Rubber manufacturers agreed upon a standard section, pointing to uniformity in steel channel in future, which will permit of the application of a Tire of any make to any wheel of the re-

quired size. There is also a movement toward standardizing the number and position of lugs for single Tube Vehicle Tires, so that all Tires of this type will fit any standard rim.

There has been much litigation during the year over the Grant patent for solid Rubber Tires of the type that are held in place by two or more longtitudinal wires running through the Rubber, the ends of the wires being welded together electrically. This patent having been disregarded by a number of Rubber manufacturers, suits for infringement were brought with different results in the lower United States courts in Ohio, Georgia and elsewhere. Thus far the advantage seems to be on the side of the assailants of the patent, and it is not yet known whether the owners of the patent will appeal to the United States Supreme Court. The result of the litigation thus far, at least, has been to increase the number of alleged infringers, and the Rubber manufacturers who are not paying royalties under the patent have been able thereby to depress prices to consumers.

THE SO-CALLED TRUST IN THE MECHANICAL GOODS TRADE.

controlling several factories producing Belting, Hose, Packing and the like, underwent a change of management during the year. A Wall street firm which had undertaken to deal extensively in its shares found itself with large holdings, which, in view of the wide distrust of "industrials," were unmarketable, although the company had been doing a really good business. The brokerage firm thereupon made a successful attempt to control the annual election, installing a new management and a new policy. One of the most successful manufacturers in the country has been placed in charge of all the factories in the trust, instead of their being controlled by the several constituent companies, as before. This uniformity of control gives to all the factories the benefit of the policy which has brought unusual success to the new manager at his own factory, and is expected to remove an element of friction inevitable so long as the various factories remained, in a sense, competitors. The same policy has been further exemplified by placing the productions of Tires in the company's factories in charge of one man, who also had demonstrated his special fitness for such work. While the trust nominally is still to be managed by a board of directors, these are men unacquainted with the Rubber industry, and the active direction will be in the hands of the two experts referred to. The record of these gentlemen is regarded in the trade has an earnest of a policy of maintaining a high standard of quality, and selling only at a profit —a position which will be welcomed by the conservative independent concerns who deplore that sort of competition which depends for trade solely on price-cutting, with its frequent concomitant, lowering quality.

THE UNITED STATES RUBBER COMPANY.

The other so-called trust, the United States Rubber Company, whose specialty is Rubber Boots and Shoes, began the year by making a loan of $12,000,000, for the purpose of refunding its floating debt and providing a more liberal working capital—its earnings in the past having been disbursed too freely in dividends. Fortunately for this company, and for all its competitors as well, dealers' stocks throughout the country were very low at the beginning of the season, while the weather conditions thus far this winter have stimulated buying by the public to an unusual degree. The United States Rubber Company has marked a new departure in the industry by undertaking to secure control of the production of its chief raw material, instead of buying Crude Rubber in New York and Liverpool. It has subscribed largely for shares of a company organized to exploit Rubber in the Acre district, on the upper Amazon, under a concession from the Government of Bolivia. Whatever success it may attain, however, the collection of Crude Rubber is not a business which Rubber manufacturing companies in general can hope to undertake, although unquestionably there is often a wide margin between the first cost of Rubber in the valleys of the Amazon and the Congo and its cost to manufacturers in the United States.

Tinware.

Business for the year in a general way has been very satisfactory. Very conservatively put, there have ben orders enough to go round and there has not been the same competition of a disastrous kind as has characterized former years. Prices as a rule are lower than they were a year ago. This is accounted for in several ways. One reason is the reduction in the price of tin plate of about 10 per cent., December 1. Another contributing cause was the desire of the producers, acting in concert, to secure orders to tide over the month or two preceding and following the beginning of the new year, a period usually the dullest of the 12 months. Accordingly about December 1 some concessions in the way of extra discounts were made to heavy buyers from the voluminous net prices customarily quoted. Some prices are said to be very low in the more staple lines and out of comparison with other items. How long this condition will remain is problematical, especially in view of the marked increases in labor costs continually occurring, the shortage and consequent higher price for fuel, which one important concern estimate will cost them from $30,000 to $50,000 next year in excess of last year, applicable to both coal and petroleum. What good judges of the situation are certain about, however, is that they have had an exceptional good business and never had better, coupled with the prediction that just as much business will come to them in 1903. A factor referred to with some satisfaction is the steadying influence predicted as a result of the absorption of the Sharon Rolling Mills by the United States Steel Corporation, in view of their policy to keep raw materials steady on a fair basis. So far as we are advised no changes are contemplated at present in Enameled Wares, which are made by most of the larger concerns producing Tinware, although, it is said, if raw materials applicable to this industry, together with labor, keep moving higher some advances must be made.

Carriage Bolts, Machine Bolts, &c.

The market in this line of goods has during the year been active with an advancing tendency for the greater part of the time. A number of formal advances have been made by the associated manufacturers, and in February a revised list of Carriage Bolts was adopted, which also embodied higher prices. Toward the close of the year there has been some weakening in values and concessions have been made, without, however, any formal change in quotations. The regular published prices of the associated manufacturers at the beginning and the end of the year are as follows:

	January.	December.
Common Carriage Bolts	65 and 2½ %	60 and 5 %
Machine Bolts, with H. P. or C. P. Plain Nuts	70 and 2½ %	65 %
Machine Bolts with C. & T. Nuts	65 and 7½ %	60 and 2½ %
Machine Bolts, without Nuts	70 and 12½ %	65 and 10 %
Machine Bolts, Blanks	70 and 2½ %	65 %
Bolt Ends, with H. P. or C.P. Plain Nuts	70 and 5 %	65 and 2½ %
Bolt Ends, with C. & T. Nuts	65 and 10 %	60 and 5 %
G. P. Coach Screws	75 %	70 and 10 %
Cone Point Lag Screws	75 and 5 %	70 and 15 %
Skein Screws	75 %	70 and 10 %
Forged Set Screws and Tap Bolts	60 %	50 and 15 %
Plow Bolts and Guard Bolts	60 and 5 %	60 %
Washer Head Coach Screws	70 and 5 %	70 %

Shovels, Spades and Scoops.

In this line of goods the feature of the year has been the struggle going on between the associated and outside manufacturers, with a substantial reduction in prices November 15. A rapidly increasing competition from outside manufacturers, which for a time was ignored, at length the associated manufacturers were obliged to recognize. A cheaper grade of goods called the Bear brand was introduced by them, which tended to displace the regular fourth-grade goods. To meet this condition the outside manufacturers brought out a corresponding grade, under such brands as Bull, Crow, Mule or Bat, which were generally designated as animal brands. The associated manufacturers then reduced

prices on practically the entire line, but most radically on those goods on which competition was most troublesome. This reduction went into effect November 15, but was announced by the manufacturers nearly a month before. Their course in this matter called out a good deal of criticism on the part of the jobbing trade, and the market remained in an uncertain and demoralized condition until the decline was formally announced. The revised prices so nearly approximated the actual cost to those who were favorably situated that they were uncomfortably low to those whose facilities were not the best. The outside manufacturers met these low prices and in some cases went beyond them. The market is thus in an unsatisfactory condition, with, however, a good volume of business.

Horseshoes.

On January 3 the associated manufacturers of Horseshoes advanced the price of all Shoes 10 cents per keg. This was followed by a further advance of 25 cents per keg in July. A conservative estimate, made at that time, represented the cost of Shoes to be 50 cents per keg over that of the corresponding period of the year before, caused by the increased cost of coal, iron and steel. A meeting of the associated manufacturers was held in December and existing prices confirmed.

Nuts.

Manufacturers of Nuts, both Hot Pressed and Cold Punched, have enjoyed an active business throughout the year. In sympathy with the condition of the iron market, and as a result also of the heavy demand upon their manufacturing facilities, prices have as a rule been quite firmly maintained, several advances having been made. The regularly announced prices, from which the usual concessions are made to the large trade, at the beginning and close of the year, are represented in the following table:

	January. Off List.	December. Off List.
Hot Pressed Square Blank	5.20	4.80
Hot Pressed Hexagon Blank	5.80	5.00
Hot Pressed Square Tapped	5.00	4.60
Hot Pressed Hexagon Tapped	5.60	4.80
Cold Punched Plain Blank Square Nuts	5.00	4.50
Cold Punched Plain Blank Hexagon Nuts	5.30	4.60
C. T. & R. Blank Square Nuts	5.20	4.70
C. T. & R. Blank Hexagon Nuts	5.80	5.00
Cold Punched Plain Tapped Square Nuts	4.80	4.30
Cold Punched Plain Tapped Hexagon Nuts	5.10	4.40
C. T. & R. Tapped Square Nuts	5.00	4.50
C. T. & R. Tapped Hexagon Nuts	5.60	4.80

Sash Weights.

Soon after the first of the year the National Sash Weight Makers' Association was formed, which adopted a scale of prices for different sections of the country, according to the local conditions and cost of material and labor. Prices were advanced two or three times during the year, owing to the scarcity of fuel and the high price of raw material, and the market enters the new year in excellent shape. The understanding between the manufacturers is such as to contribute much to maintenance of reasonable prices.

Boxwood and Ivory Rules.

A new and thoroughly revised list of Boxwood and Ivory Rules was adopted by the manufacturers the first of the year. The list which had been in use developed a number of inequalities, in order to correct which the new list prices were agreed upon.

Binder Twine.

Prices were not generally announced by manufacturers until the last of February or the first of March, owing to the unsettled condition of the fiber market. Quotations were then made on the basis of 10¾ cents per pound for Sisal, f.o.b. New York, with a rebate of ¼ cent per pound in carload lots. The last of April prices advanced to 11 to 11¼ cents, followed in June by 11¾ to 12 cents, and in July by 12 to 12¼ cents per pound. The range of prices given above as representing these successive advances indicates that quotations were not uniform with all manufacturers.

Tacks.

The market was in an unsatisfactory condition during 1902, and prices were irregular. While some manufacturers announced an advance in prices during the fall on account of the increased cost of material, fuel and wages, considerable unevenness in quotations continued. List prices and discounts are somewhat complicated and require scrutiny to insure satisfactory purchases.

Steel Goods.

The great event in the Steel Goods market was the merging of nearly all of the great manufacturers in a strong company. This was effected in September, the consolidation being known as the American Fork & Hoe Company, who are now in practical control of the market. Shortly after the merger an advance on last season's prices was made in view of the increased cost of material and labor. The trade have purchased liberally for their next year's supply, and the market has a steady and confident tone. A further advance of about 5 per cent. was made December 15.

Conductor Pipe and Eave Troughs.

This is one of the departments of the market which is under excellent control, and the prices current among the trade have been consequently quite regular. The declines which occurred in the sheet iron market affevted this line, and in October a reduction in prices of about 7½ per cent. was made. Under the arrangements for marketing these goods the country is divided into various sections, for which varying discounts are made according to their distances from the sources of supply.

Window Glass.

During 1902 the American Window Glass Company dominated the situation. Most of the outside factories were combined under the Federation Window Glass Company. The Independent Glass Company were reorganized, and all three combinations have been working in harmony as to prices. Wages were advanced for the 1902-1903 fire, which necessitates an advance in the price of Glass. All these results were brought about with considerable agitation. The amount of Glass to be taken by the National Window Glass Jobbers' Association has called for numerous conferences. An agreement was at last reached as to the number of boxes to be delivered before March 1. The Jobbers' Association quotations for Glass from store in January were 90 and 10 per cent. discount. They advanced to 90 and 5 per cent. in March, to 90 per cent. in April, to 89 per cent. in May and to 88 and 5 per cent. in July. Considerable shading of prices has been indulged in from time to time to influence business, and conditions throughout the year have generally been unsatisfactory from the jobbers' viewpoint. A new jobbers' list was adopted December 16, from which the jobbers will sell to the trade, the discounts to which the list is subject being as follows: Small lots from store, 90 and 10 per cent.: carloads, f.o.b. factory, 90 and 20 and 2½ per cent.

Linseed Oil.

The year opened with City Raw Oil, in lots of five barrels or more, quoted at 55 cents per gallon. It advanced until it reached 67 cents during July and the first half of August, after which the decline was gradual until 46 cents was reached in December. The 1901 flax seed crop was in control of strong hands during the first half of 1902. The 1902 crop was the largest ever grown in this country. The size of the crop and probable surplus to be carried over had the effect of weakening the Oil market. Market conditions were generally unsatisfactory during the year, which curtailed the consumption of Oil to a considerable extent.

Spirits Turpentine.

Prices in New York gradually advanced on the basis of machine barrels, from 39½ to 40 cents in January to 55 to 55½ cents per gallon in December. A smaller crop, restricted output, control of the market at Southern points, together with a good demand, all tended to increase values.

Paris Green.

The price the last of January, 1902, on the basis of Arsenic kegs or casks ranged, according to maker, from 10¾ to 12 cents per pound. The difference in quotations arose from the fact that there was no price agreement among manufacturers. The advance was gradual until the price reached 13 cents by the middle of June, at which figure orders were being accepted for delivery up to July 1. The indications are that the market for 1903 will open on the basis of about 10½ to 11 cents per pound in half barrels, with the usual advances for smaller packages.

Cordage.

There has been a wide range of quotations and frequent fluctuations in Rope during the year. Prices have ruled high, and mixed Rope and substitutes have been freely put on the market. Manufacturers, in some instances, have made Rope to correspond with buyers' ideas as to price. Close buyers have usually been able to shade card prices, and in some cases attractive quotations have been made to clean up overstocks at mill. Demand has been rather light than otherwise throughout the year. Sisal Rope has ranged in price from 7¾ to 12½ cents, and Manila from 10¾ to 13 cents per pound, with the usual rebate of ¼ cent in large lots. The lowest quotations represent mixed Rope and the highest quotations pure Rope.

White Lead.

There was a good demand for White Lead in Oil during the year, with no marked changes in prices. The best brands were quite uniform at 6 to 6½ cents per pound, according to quantity. Good brands and those less favorably known could be bought at slight concessions from the above quotations.

CHICAGO HARDWARE TRADE IN 1902.

THE year 1902 has been marked by interesting developments in the Hardware industry. While many features have resembled the general characteristics of business transacted in 1901, there have been marked departures from all precedents in many departments. Prices of various goods have fallen and risen independently of prices in even kindred lines. While of course there has been a sympathetic movement in goods of a similar nature, special conditions at times have broken the connection. These facts have given to the year's business a checkered appearance.

Yet, after all is said and done, there seems to be little doubt that the volume of business during 1902 has exceeded that of any other like period. As to profits in the trade that too seems well established, there being reason to believe that all ends of the market, from manufacturer to consumer, have experienced an unusually successful year. Whether the year's business measured in dollars and cents, especially among jobbers, may prove equal to 1901, or the boom year of 1899, is in doubt because of the reduced prices on many heavy lines during the second half of the year. This can only be accurately determined after books have been balanced. A number of local firms have taken inventories, but others will not have completed their accounts until some time in January. But the impression is that the aggregate will show a handsome increase.

The Manufacturer's Standpoint.

From the standpoint of the manufacturer there is wide variation of experience. Those manufacturers that have been self contained—that is, possessing raw material from which to manufacture finished goods—have experienced the most satisfactory year of their history as to volume, amount and profit. This is especially noteworthy in the face of keen competition and lower prices resulting from such trade warfare. Independent manufacturers, especially of Nails and Wire, while securing a fair profit during the first half of the year, suffered somewhat from dull trade during the second and third quarters and had their profits greatly reduced during the third and fourth quarters by the narrow margin between selling prices of finished goods and the cost of Billets and Rods, they being compelled to depend upon the open market, where the intermediate product was unusually scarce, resulting in the consumption of considerable imported Steel. But with all these drawbacks the tonnage of Wire and Nails sold shows an increase of from 12 to 15 per cent. The aggregate sales were about 1,400,000 tons, a gain of about 240,000 tons over the tonnage of 1901. The sales of Wire Nails show an increase of about 10 per cent., Barb Wire about 9 per cent. and Plain Wire about 6 per cent. over the sales of 1901.

It seems probable that the same conditions will be found to exist in Steel Sheets, Tin Plate and Merchant Pipe, the increased volume of business more than compensating for the reduction of prices. In other lines of Heavy Hardware, such as Bars, Rounds, Angles and other shapes, a very large tonnage has been distributed at very remunerative prices.

Satisfactory Jobbing Trade.

In general lines of standard goods and Shelf Hardware the net result of the year from present indications will be a gain of from 10 to 12 per cent. in the volume of business transacted, although in special instances a gain of fully 25 per cent. is claimed. This result, too, has been achieved in the face of very discouraging circumstances, such as the long continued wet weather during the summer and the strike epidemic, of which there were manifestations throughout the year, but especially the freight handlers' and teamsters' strike in July, which cut down the trade of local jobbing interests fully 20 per cent. Other discouraging features were the inability to obtain goods promptly, the difficulty in making shipments because of lack of cars and motive power, and the falling off at various times, due to the caprices of the weather, as well as floods and a partial failure of crops in restricted districts tributary to this market.

But in the main the sound foundation furnished by large crops at remunerative prices was of importance, contributing to the general prosperity by fully maintaining the purchasing power of the rural districts, which has been the conspicuous feature of business for several years.

Concentration of Large Interests.

Among the other important features of the year have been the efforts to combine the great jobbing interests and the merging of many plants manufacturing Hardware Staples and Specialties. Among the most important interests effected have been the Nail and Wire interests—the United States Steel Corporation now controlling fully 85 per cent. of these products—and the Farming Tool manufacturing interests by the organization of the American Fork & Hoe Company. A consolidation of the Edge Tool interests is now pending.

Vigorous Opening of the Year.

The year opened under very auspicious circumstances with a heavy volume of business in many lines, it being claimed that never were such large orders received during the inventory season. Trade needed little stimulation, orders being sent in by mail without solicitation from salesmen. A feature of the trade was the heavy demand for spring goods, which were wanted for immediate shipment, it being deemed desirable to have merchandise in stock and thus avoid the troubles incidental to the usual spring rush and delayed deliveries. The movement in Nails and Wire Fencing was especially large and dealers in Heavy Hardware reported an unusually vigorous opening of the year, there being a good movement in Wagon Material especially. Horseshoes were advanced 10 cents, and the trade were warned that the market was subject to further change without notice. Plow Shares and kindred goods were also marked up from 5 to 7½ per cent. Hammers, Picks and other handled goods rose 10 per cent., and Turnbuckles were also higher.

Very early in the season much difficulty was experienced in obtaining shipments of Bolts, Washers and similar wares from the factories. The exceptionally heavy trade in Wire Nails and other Wire products was due largely to the expectation of an advance in prices,

and the preceding month had been marked by a cut in freight rates, which had induced larger shipments of heavy goods. This active movement was accompanied by a general distribution of general lines, the unusually open weather permitting the consumption of such Hardware. The jobbing trade gave early evidence of having prepared for an active campaign, getting stocks well in hand. Because of the great scarcity of Steel Billets and the probability of higher prices trade in Steel Goods was stimulated beyond the ordinary.

Late in January there was a phenomenal movement in special classes of merchandise, especially in Tin Plate, which had never before been so active in midwinter. The demand for Roofing Plates was particularly heavy. Wire Cloth, too, was scarce and wanted by manufacturers of Screen Doors, who were coming into the market to purchase from jobbers, it being difficult to obtain ample supplies from manufacturers. A shortage, too, was predicted in Poultry Netting, the demand being extremely active. The volume of orders for immediate shipment of Agricultural Goods was a surprise to the trade.

The increase in the value of goods during January was estimated at 30 to 40 per cent., which in large measure accounts for the increased volume of trade. The prices of Wire Nails were advanced 5 cents per keg by manufacturers on the last day of January, and other Wire products sympathized.

Trade Suffers from Storms.

Early in February trade suffered from the effects of heavy snow storms. The falling off was especially felt in building material. Late in February one of the largest manufacturers of Wire Cloth and Netting advanced prices of both Wire Cloth and Hexagon Netting, due to inability to obtain a sufficient stock of raw material. Other manufacturers refused to accept additional orders, their capacity for the season being completely sold. At this time manufacturers' agents were receiving heavy orders for Axes.

The prospect for spring trade seemed to have improved from the heavy snows in the West, which had protected the winter wheat, but the scarcity of cars began to be complained of at this time.

About the middle of March trade which had been affected adversely by almost impassable roads in the country showed some improvement, the demand being reflected especially in Conductor Pipe and Eaves Troughs. But the leading feature was the usual spring rush in seasonable articles, such as Garden Tools. Heavy Hardware merchants were experiencing the largest volume of business of their history, the recent advance in Iron and Steel products by the mills and factories stimulating trade.

Toward the latter part of March many jobbers were compelled to work night force to keep pace with the rush of business. Trade was largely in Mechanics' Tools, Farming Implements and Garden Supplies. There was an especially heavy movement in Wire Fencing. Heavy Hardware merchants were notified of a 20 per cent. advance in Set and Cap Screws.

Heavy Trade in March.

Early in April it was discovered that trade during March was the heaviest ever experienced by the Chicago Hardware trade, notwithstanding the occasional checks received by unfavorable weather, storms and almost impassable roads in the country. It is worthy of note that the retail merchants of Chicago had not experienced such a liberal volume of patronage since the memorable days of the World's Fair in 1892 and 1893.

As the season advanced the scarcity in Screen Doors and Wire Cloth became more pronounced, and about the middle of April jobbers advanced prices. An interesting feature was the springing up of a demand for Bicycles, one local house reporting sales of Cycles up to that time more than had been sold during the entire preceding year. Quite heavy orders were placed for Bale Ties at this time, both for immediate and future shipment. To cover increased cost of manufacture, Builders' Hardware was advanced early in April 20 per cent., to take effect immediately.

Toward the latter part of April there was an especially active demand for Shovels and Spades, some houses booking orders three times greater than those of the corresponding period the year previous. House Furnishing Goods were being called for liberally, and the demand for Implements and Tools has scarcely ever been equaled. An interesting feature of the trade was the phenomenal demand for Ice Cream Freezers, sales at that time exceeding those of the preceding year by about 60 per cent., while the volume of business in Heavy Hardware was immense, including Bars, Channels and Structural Shapes.

Spring Rush in Builders' Hardware.

Early in May the demand for Carpenters' Tools was especially active, the demand being stimulated by the manufacturers' advance on Chisels and Draw Knives. But the trade in Locks and other Builders' Hardware was the most prominent feature, some jobbing houses having sold during March and April more goods than they had previously disposed of in a period of 12 months. The remodeling and refitting of buildings incidental to the moving season was credited with bringing about this condition. The scramble for Wire Cloth continued more urgent, being exhilarated by an advance of 5 to 10 cents per 100 feet. During the first week in May, however, there was less urgent demand for other seasonable goods, the decreasing interest being attributed to the fact that farmers being engaged with spring work were making fewer calls on retailers to be reflected in the jobbing trade. The generous rains which fell in Iowa, Kansas, Nebraska, Missouri and Illinois were accepted as favorable to the continuance of confidence and a continued active Hardware trade during the coming year.

Toward the middle of May there was a revival in trade, the demand for Ice Cream Freezers and Refrigerators being especially active. At this time much interest was taken by the trade in the efforts to combine the leading jobbing houses of the country, which had been undertaken about a month previous. About the middle of May it was reported that some important interests previously identified with the combination had withdrawn, having declined to renew options which expired on May 1. Others, however, renewed options to June 1. Some local houses were directly interested in the movement. Within a few days it was known that the efforts to consolidate the jobbing interests had been abandoned.

Late in May an active movement was in progress in Heavy Hardware, including Bar Iron, Blacksmiths' Supplies, Steel of various shapes, and Spokes, Rims, Hubs and other Carriage and Wagon material, but the demand for Wire Nails fell off perceptibly, as usual at that season, but an unusual scarcity developed in Cut Nails, which were firm.

With the approach of June there was quite an active demand for Lawn Mowers, Hose, Garden Tools, &c., and although jobbers had placed orders for Lawn Mowers for 20 to 25 per cent. in excess of the previous year, it was necessary to place duplicate orders with manufacturers to meet the urgent demand. About this time there was some interest manifested in the attempt to revive the jobbers' combination, but the negotiations resulted in nothing.

Wire Production Reduced.

The prominent feature in June, outside of the sales department, was the determination of independent Wire mills to curtail production during June, July and August, their action being based upon slow trade, and also the difficulty of obtaining Steel Billets in ample quantities at reasonable prices. In pursuance of this determination several of the largest independent mills either closed down or materially reduced output. Late in the month there was an advance in prices in heavy staple articles, such as Machine Bolts, Lag Screws, Heavy Hammers, Sledges, Wedges, Picks, Mattocks, &c., manufacturers making a reduction of 10 per cent. During the month there was quite a fair movement in seasonable goods, such as Refrigerators, Ice Cream Freezers, Lawn Mowers and Screen Doors for quick delivery, and considerable business through the

placing of orders for fall delivery on such goods as Stove Boards, Elbows, Coal Hods, Lanterns, Axes, &c.

The crop outlook was being watched at this time with keen interest, and all news from the winter wheat belt, from the spring wheat and flax districts, from the cotton sections and the corn States was uniformly encouraging.

Early in July there was a decided falling off in orders, the mail being burdened with numerous complaints and excuses, in which the wind and the rain had the lion's share of comment. The cold, wet weather experienced through most of the month of June, it was feared, would materially affect the crops and hence discourage the placing of orders. Sheet Zinc was advanced ½ cent by manufacturers the first week in July.

Adverse Developments.

The freight handlers' strike and Independence Day together had a depressing effect on trade. Great difficulty was experienced in either receiving or shipping goods. In fact, for several days local trade was completely tied up. In reviewing events at this time, it is now known that trade suffered materially, there being a falling off from 25 to 30 per cent. as compared with the corresponding month a year previous, but a part of this loss was due to the fact that July, 1901, had been an unusually active period. Some heavy contracts for Builders' Hardware, however, were placed at this time.

Depression in business continued until the settlement of the teamsters' and freight handlers' strike, after which there were quite heavy shipments of congested freight, but it was not until in August that the full effects began to wear off.

An interesting feature at this time was the scarcity in Weaving Wire, the mills running double turn to keep pace with orders, some of the smaller companies having their entire capacity booked for a year. Toward the latter part of July there was an advance in prices in cast iron specialties, such as Kitchen Utensils and Pitcher Spout Pumps. There was a very decided scarcity developed in Squares and Chisels, one or two houses reporting that they had never before had such difficulty in obtaining ample supplies. Some very heavy orders were placed by the manufacturers for Wire Rope for fall delivery. The continued wet weather had a depressing effect on Tire Steel trade and other Heavy Hardware used by Carriage and Wagon manufacturers.

Early Call for Fall Goods.

Early in August the feature of interest in jobbing circles was the call for fall goods for unusually early shipment. This was especially noticeable in such lines as Enameled Ware, Cutlery, Barley Forks, to say nothing of stove equipment. In Builders' Hardware manufacturers' agents reported that they continued to find much greater difficulty in making deliveries on contracts than in securing new business. Some manufacturers were still from 50 days to four months behind in making shipments. While the Wire Nail trade was still reported dull, it is notable that manufacturers' stocks on August 1 were lighter than on July 1, showing a liberal distribution on old contracts and some new business. One point worthy of notice was that the volume of business in Clothes Wringers was very heavy, local distributers reporting an increase of 75 per cent. compared with a year ago for the entire year up to August 1. But during the latter part of the summer there was a natural decrease.

Toward the latter part of August there was a revival in the demand for Wire Nails, some stocks being ordered even by Wire, indicating that supplies in the hands of jobbers were very low. About this time, too, there was an increased business in Steel Springs, the manufacturers of Beds, Car Seats, &c., preparing for their season's work by placing larger contracts for material.

During the last week in August the prices on Butts and Strap and T-hinges were reduced 5 per cent. by manufacturers. During the latter part of August and early September there was a considerable increase in transactions, activity being especially noticeable in heavy lines, such as Miners' Tools, Blacksmiths' Supplies, Tin Plate and the higher grades of sheet iron and sheet steel, more especially refined and planished iron and smooth steel. These latter grades were unusually scarce. The demand for Axes was stimulated by an advance in prices. It developed that there was considerrable difficulty in obtaining some lines of Cutlery promptly, as, for instance, Pocket Knives, manufacturers refusing to make deliveries until October. During the latter part of August there was a revival in the keen competition in Shovels, independent manufacturers reducing prices to compete with reductions made by the associated manufacturers. Special lines were put out under various brands for competitive purposes. Some important mills were reported sold up on Upholstery Springs for the season. The demand for Barb Wire, Music Wire, Pump Rods, Shafting, &c., showed a material increase during the latter part of August and throughout September.

Toward the middle of September it was announced that there was less cutting of prices than usual on standard goods, and specialties were much better maintained. All kinds of cast iron goods and most lines of steel goods gave evidence of a strong upward tendency. A firmer tone also prevailed for Copper Sheets, and one feature of interest was the liberal buying of toys for the holiday trade. Manufacturers of some lines of Lawn Mowers advanced prices on their goods for next year's delivery 5 per cent., and salesmen were canvassing actively throughout the country.

Animation in Heavy Hardware.

During the latter part of September there was considerable animation in Heavy Hardware, there being a large urgent demand for large sized Flat and Round Bars, Channels, Beams and Angles, and some liberal orders were placed for Carriage Bolts and Lag Screws for mill shipment, deliveries extending over four months. The competition in the Shovel trade had reached a very interesting point, with indications that some efforts were making to take decisive steps to improve existing conditions. There was quite a liberal distribution of Laundry Goods and Kitchen Utensils throughout the early fall. Manufacturers of Refrigerators late in September decided upon an advance of 5 per cent. in prices on goods for 1903 delivery. Agents for manufacturers of Lawn Mowers reported heavy business, with capacity of some factories completely sold.

Early in October there was a decided lull in the jobbing trade, the general experience being that buyers were accountable, holding off their purchasing, and there was a general renewal of complaint that goods ordered from manufacturers a month previous could not be obtained, and there were very frequent and annoying delays of goods in transit. As indicating the trial suffered from delayed deliveries, it was noted that some lines of Builders' Hardware that had been ordered in January were not delivered until October. It is notable, however, that most manufacturers of Builders' Hardware were making very much better deliveries by this time. There was a fair movement at this time in Skates, Sleds, Toys and other holiday goods, including Cutlery.

The cancellation of many orders for anthracite stoves because of the miners' strike was reflected in the curtailment of the demand for Bolts from stove manufacturers. To a large extent, however, the jobbing trade was compensated for fewer sales of anthracite stoves by an increased sale of gas, soft coal and wood stoves. Reports from traveling salesmen at this time were rather discouraging, and jobbers in the Missouri River district especially were reported restive under the absence of seasonable trade, resulting from heavy rains and poor roads preventing the marketing of produce. There was also an unsettled feeling incidental to rumors of cuts in prices on Nails and Wire. The keen competition, however, was more in the Southwest than in the Chicago district, although local manufacturers and dealers were largely affected. The manipulation of freight rates to the South and Southwest was, in large measure, responsible for the unsettled condition.

Wire and Nail Prices Drop.

On October 1 the largest interest in the market made a sweeping reduction on Nails, Wire and Staples, and it is notable that the effect of the lower prices on such products, as well as on Sheets, was an increased volume of business, many of the trade having held off in anticipation of some radical action. From this time on there was a steady improvement in the Wire trade.

With the advent of fall there was an increase in the orders placed for Shells and Ammunition of all sorts. Manufacturers of Steel Goods gathered some liberal orders during the early fall for 1903 delivery. An unusual demand for Steel Hatchets and Hammers was experienced by some manufacturers' agents, it being reported by some that the month of September contributed a volume of business greater than the combined three preceding months. This was exceptional, trade in September usually being below the average. It is worthy of note that many Hardware manufacturers shared with mills and foundries in the many annoying and expensive delays resulting from the peculiar conditions in the raw material situation. Capacity of some manufacturers was cut down one-third. Associated manufacturers of Hoes, Rakes and Forks continued to take liberal contracts for 1903 delivery into the middle of October, and independent manufacturers in the same line also found no difficulty in obtaining a full order book. Manufacturers of Saws reported a very large volume of business, with the various plants overwhelmed with business for forward delivery.

Trade Again Increasing.

During the latter part of October there was a material increase in business in all lines, but some trade was delayed from the lateness of harvesting the grain crops.

The new schedule of prices adopted by the Shovel Association to be effective November 15 became current in the trade too soon to allow many jobbers to reduce stocks, which caused considerable talk and no little feeling among certain of the jobbing interests. The establishment of a schedule on Wire Goods and Wire Netting late in October was followed by the placing of liberal orders by manufacturers and followed very closely by considerable business among jobbers. About this time an unusual scarcity was developed in Carpenters' Planes and Rules among the jobbing trade, such goods being in active demand for immediate distribution.

Early in November an interesting phase of the market was the trade war inaugurated among manufacturers of Strap and T Hinges, resulting in a drop of 10 per cent. in prices of these goods. Many jobbers were quick to avail themselves of the situation and purchased goods in carload lots even on top of full stocks, anticipating a full settlement. Competition continued active throughout November and a part of December, however.

In the usual fall line of goods and in holiday wares there was considerable activity throughout November, there being an especially brisk trade in Skates, Toys, Cutlery, Axes, Lanterns, Stove Boards, Stove Pipe, Coal Hods, &c. The sales of Oil Heaters continued active and urgent throughout the fall, October probably being the largest month in this line that the trade had ever experienced.

Tin Plate Declines.

A reduction in the price of Tin Plate was announced early in November. A decline had been anticipated by the trade from general conditions, but the drop of 40 cents per box was somewhat of a surprise, consumers not anticipating such a heavy cut.

About the middle of November rumors were current that negotiations which had been in progress for the consolidation of Axe and Tool companies had been suspended, but later it was reported that the merger would become effective on January 1.

An advance of 10 per cent. in prices on Chisels, Augers, Drawing Knives and Braces was reported as contemplated, but had little effect on the trade. The reduction in prices of Shovels which became effective November 15 had little influence, the effect of reduced prices having been discounted for several weeks. Late in November Stove manufacturers placed considerable orders for Stove Bolts.

Throughout the year there had been quite a liberal distribution of Screws, but the trade was very unsatisfactory to manufacturers because of the low prices prevailing. It is anticipated that the recent merging of manufacturers' interests may be productive of more remunerative prices. Late in November there was a material falling off in orders for seasonable goods incidental to the unseasonable warm weather, which was also felt in holiday lines and in Ammunition. Some manufacturers of Coffee Mills announced an advance of 10 per cent in prices in November.

Concentration of Wire Capacity.

Late in November the trade was startled by the announcement of the consolidation of the Union and Sharon companies in the East with a capitalization of $50,000,000. It was also reported that three other mills would enter the combination, but, as is now well known, the consolidation of the two large independent mills in the Wire trade was followed by their merging into the United States Steel Corporation, which was even a greater surprise to the consuming interests. It is now believed that the largest interest in the market controls fully 85 per cent. of the product of Nails and Wire, which insures a steady market for such material indefinitely.

Late in November there was a much more satisfactory tonnage in Sheets, as well as in Nails and Wire, although the market on the latter was still somewhat disturbed by cuts in prices. Rivets were reduced $3 per ton by manufacturers, and the prices of Sash Weights were advanced about 10 per cent. during November. An advance in Builders' Hardware was contemplated by associated manufacturers late in November, but due to a lack of unanimity no change was made.

The month of November, taken as a whole, proved a very satisfactory period for local jobbers, some houses reporting the largest monthly trade in three years. The open weather early in the month while interfering with the movement of winter goods was productive of increased orders for seasonable articles, among them being Tools of various kinds.

Early in December there was a drop in the price of Sheet Zinc, sales being made on the basis of 6¼ cents.

Heavy Trade in Wire and Nails.

Throughout December a very heavy volume of business was transacted in Wire and Nails, both the consolidated and outside mills being overwhelmed with orders. In large measure this was due to the prospective advance in freight rates which became effective January 1. So heavy was the business that customers were notified to rush in specifications, as all orders received after December 20 for December shipment would be booked at the buyer's risk. Trade in this line probably was also stimulated by the fact that there is usually much difficulty in obtaining goods promptly in the early spring and to avoid this annoying and unprofitable condition the size of orders was probably considerably increased. But, above all, the greatest incentive to large volume of trade is traced to the general sentiment that an advance in the prices of such goods would probably become effective before the spring rush. The zero weather experienced about the middle of December brought a flood of business for cold weather goods and a second crop of orders for the holiday trade.

Outlook Favorable.

An interesting feature is the material growth in the distribution of Paints and Bristle Goods by the Hardware interest throughout the year. This line is proving a very satisfactory one, both in volume and in profits. Late in the month some liberal orders were placed with the distributing interest for spring delivery. Quite a number of important orders were also booked by manufacturers of Builders' Hardware for delivery during the spring months of 1903, and as a sign of harmony and more uniform prices it is interesting to note that manufacturers outside the association have shown a disposition to adjust prices in conformity with the association scale.

Chicago Wire Nail Prices.

The course of prices of single carload lots at Chicago during 1902 and for several years preceding is shown in the following table, the monthly prices being averaged from weekly quotations in our market reports:

Months.	1902.	1901.	1900.	1899.	1898.	1897.	1896.	1895.
January	$2.16	$2.35	$3.53	$1.59	$1.55	$1.50	$2.42	$0.95
February	2.20	2.45	3.53	1.73	1.57	1.45	2.42	.95
March	2.20	2.45	3.53	2.09	1.55	1.50	2.57	1.00
April	2.20	2.45	3.28	2.25	1.47	1.45	2.55	.95
May	2.20	2.45	2.53	2.35	1.45	1.42½	2.70	1.10
June	2.20	2.45	2.48	2.60	1.43	1.42½	2.70	1.50
July	2.20	2.45	2.43	2.70	1.36	1.35	2.70	1.95
August	2.20	2.45	2.43	2.80	1.36	1.37½	2.70	2.20
September	2.15	2.45	2.35	3.10	1.45	1.50	2.70	2.40
October	2.05	2.42½	2.35	3.20	1.47½	1.52½	2.70	2.40
November	2.00	2.35	2.35	3.28	1.40	1.50	2.70	2.42½
December	2.00	2.25	2.35	3.53	1.37½	1.50	1.60	2.42½
Average for year	$2.14½	$2.41	$2.76	$2.60	$1.45	$1.46	$2.54	$1.68⅝

Chicago Barb Wire Prices.

The course of prices of Galvanized Barb Wire, in single carload lots, Chicago delivery or equal, has been as follows in 1902 and several years preceding, our weekly quotations being averaged:

Months.	1902.	1901.	1900.	1899.	1898.	1897.	1896.	1895.
January	$3.01	$2.95	$4.13	$2.05	$1.90	$1.90	$2.02½	$1.90
February	3.10	3.05	4.13	2.25	1.90	1.85	1.97½	1.90
March	3.10	3.05	4.13	2.62½	1.90	1.90	1.95	1.95
April	3.10	3.05	3.88	2.80	1.87½	1.80	2.05	1.90
May	3.10	3.05	3.13	2.95	1.80	1.80	2.15	1.95
June	3.10	3.05	3.13	3.20	1.80	1.75	2.00	2.10
July	3.06	3.05	3.10	3.30	1.80	1.75	2.00	2.15
August	3.00	3.05	3.10	3.40	1.80	1.65	1.90	2.55
September	3.00	3.05	3.00	3.67½	1.80	1.80	1.85	2.85
October	2.68	3.05	3.00	3.77½	1.82½	1.80	1.85	2.85
November	2.60	3.05	3.00	3.88	1.82½	1.80	1.85	2.85
December	2.60	3.00	3.00	4.13	1.82½	1.80	1.95	2.00
Average for year	$2.93	$3.04	$3.39	$3.17	$1.85	$1.80	$1.96	$2.25

Chicago Cut Nail Prices.

The following are the Chicago prices for Cut Nails in small lots during the year:

January	$2.31	July	$2.30
February	2.25	August	2.30
March	2.20	September	2.28¾
April	2.27½	October	2.23
May	2.30	November	2.20
June	2.30	December	2.20

Average for 1902 ..... $2.25
Average for 1901 ..... 2.34
Average for 1900 ..... 2.48

ILLINOIS RETAIL HARDWARE DEALERS' ASSOCIATION.

A MEETING of the Executive Committee of the Illinois Retail Hardware Dealers' Association was held at the Illinois Hotel, Bloomington, on December 28, at which time arrangements were perfected for the annual meeting of the association, which will be held at Bloomington on February 10 and 11. The Illinois Hotel has been selected as headquarters and the assembly room of that hostelry will be the place of the meeting. From present indications there will be a large attendance. The committee have already engaged music, which will be a feature of the annual gathering.

At the morning session on February 10 the delegates will be welcomed by the Mayor of Bloomington and the remainder of the morning will be devoted to official business, such as the payment of dues and the issuing of certificates and other credentials. At the afternoon session the annual address of the president and reports of the secretary and various committees will be read, after which interesting papers will be presented, followed by general discussion. On the night of the 10th the delegates are to be entertained at a smoker to be held at the Illinois Hotel. Those attending the meeting of the Executive Committee were W. T. Gormley, Chicago; H. G. Cormick, Centralia; Charles Mauer, East St. Louis; R. G. Scheurer, Vandalia; Z. T. Miller, Chicago; L. H. Clark, Rockford; H. N. Murphy, Galesburg; G. R. Lott, Chicago, and Daniel Holder, Bloomington.

DEATH OF CHARLES W. SCHLUCHTNER.

CHARLES W. SCHLUCHTNER, junior partner in the firm of F. W. Wurster & Co., Brooklyn, N. Y., died at his home, 551 Bedford avenue, December 27, in his forty-seventh year, after an illness of three months. Mr. Schluchtner was born in the town of New Lots, a suburb of Brooklyn, and as a boy entered his father's Hardware store in that town. When he became 21 years old he severed his connection there and associated himself with Frederick W. Wurster, afterward Mayor of Brooklyn. In 1882, owing to his faithfulness and ability, Mr. Wurster gave him a quarter interest in the business, which then consisted of a foundry and Wagon and Carriage Axle factory, then, as now, at the junction of Kent avenue and South Sixth street. Mr. Schluchtner's interest increased in the latter years and a rolling mill plant was added to the business. He was well known to the Iron, Carriage and Wagon Hardware trades, and was held in high esteem for his sterling ability and industry and for his gentleness of heart, as well as the willingness with which he was always ready to assist those in distress. Mr. Schluchtner was a member of the Hanover and Union League clubs, as well as the Parkway Driving Club, of which latter he was once president, and also represented his house in the New York and New Jersey Hardware and Iron Association. He is survived by a widow and five children.

REQUESTS FOR CATALOGUES, &c.

The trade are given an opportunity in this column to request from manufacturers price-lists, catalogues, quotations, &c., relating to general lines of goods.

Lord & Poll, Sheridan, Wyo., January 1 succeed Hulse & Farnham in the Hardware and Agricultural Implement business. They will carry a line of general Hardware, Implements, Stoves, Buggies and Wagons, and also conduct a heating and plumbing department. The new firm will appreciate printed matter pertaining to the above lines.

Vincel Bros. have lately opened up in the wholesale and retail business in Hardware, Stoves, Tinware, Harness, Wagons and Buggies, Wind Mills, &c., at Mill Shoals, Ill. The new firm would be pleased to receive catalogues, price-lists and other printed matter pertaining to these lines.

CHICAGO RETAIL HARDWARE ASSOCIATION.

THE Chicago Retail Hardware Association held their regular monthly meeting at the Masonic Temple on December 26, at which time officers were elected for the ensuing year. W. H. Bennett and A. J. Englehardt were appointed tellers. Several nominations were made for the various positions to be filled, and the casting of ballots resulted in the election of the following: President, Dennis McLaughlin; vice-president, H. E. Gnadt; treasurer, J. L. Smith; secretary, G. R. Lott; collector, J. Hora. Buying Committee, F. F. Porter, H. C. Peppler, O. B. Stebbins. Executive Committee, Dennis McLaughlin, H. E. Gnadt, Wm. T. Gormley, W. B. Costello, Fred. Kurtz. Grievance Committee, W. J. Krueger, J. C. Rice, G. A. Englehardt, Anton Pophal, E. L. Sommers.

HARDWARE MUTUAL FIRE INSURANCE.

CORRECTING a statement which appeared in our last issue, we are advised by C. H. Miller, Huntingdon, Pa., vice-president of the Hardware Dealers' Mutual Fire Association of Pennsylvania, that his company do not confine their operations to members of the State Hardware Association, but write insurance for any Hardware merchant of good standing, whether a member of the Pennsylvania Retail Hardware Dealers' Association or not. The matter of writing risks for Hardware merchants outside of their own State is under advisement, and will be determined at the next meeting of the company's directors in February.

LUFKIN RULE COMPANY.

LUFKIN RULE COMPANY, Saginaw, Mich., have enlarged their New York headquarters, in charge of H. G. Hollis, in the Stewart Building, 280 Broadway. What was formerly their office, stock room, &c., is now reserved for carrying a full line of all the goods they make, and in increased volume. Adjoining is a roomy connecting office for the employees, the staff of which will be increased after January 1 by the addition of Frank J. Sharp of Underhill, Clinch & Co., who will be an assistant to Mr. Harris. The company have gotten out a jointed 1-foot rule as a souvenir of the new year, which is graduated in sixteenths on one side and has the entire calendar by months for 1903 on the other, the rule being inclosed in a leather case and sent to members of firms, &c., handling their line of goods, with the compliments of the season.

CHANGES IN WIEBUSCH & HILGER, LIMITED.

THE following changes in the executive staff of Wiebusch & Hilger, Limited, 9-13 Murray street, New York, were made at a special meeting of the Board of Directors, held December 24. F. S. Seeley was elected a director to fill a vacancy. W. M. Taussig is president, as heretofore. Charles F. Wiebusch was chosen vice-president, Edward T. Smythe treasurer, and F. S. Seeley secretary. Felix B. Lippman, formerly with Adolph Kastor & Bro., has associated himself with Wiebusch & Hilger, and will cover some of the company's most important territory on their complete line.

TRADE ITEMS.

WITH Christmas greetings the Wilcox Mfg. Company, Aurora, Ill., are presenting to their friends in the trade some creditable engravings designed to increase acquaintance with their manufactures. One of these is entitled "Before the Days of the Velox Ball Bearing Grindstones." The picture is of a man grinding a scythe, the wheel being turned by a boy.

ON Saturday evening, December 27, six of the old employees of Hammacher, Schlemmer & Co., 209 Bowery, presented William Schlemmer, president of the corporation, with a handsome silver loving cup. The occasion was the fiftieth anniversary of Mr. Schlemmer's connection with the business, and the event was made a peculiarly pleasant one by the fact that most of the employees have been connected with the business and thus directly associated with Mr. Schlemmer for upward of 20 to 30 years.

THE MASSACHUSETTS SAW WORKS, Springfield, Mass., in the extension and improvement of their output, have recently purchased the entire plant of the Napier Saw Company of Rochester, N. Y. In the deal it has also acquired the ownership of all the Napier patents in the treatment of steel for this work, which, it is stated, make possible the most uniform and satisfactory product. In this reorganization the old and passing machinery of both concerns has been thrown out and the enlarged factory of the Massachusetts Saw Works has been thoroughly equipped with modern and in many cases special machinery designed for their own use. Each department has been carefully planned and fitted for the production of perfect goods. It will be of interest to the customers of the old Napier Saw Company to learn that Chas. Napier has an interest in the new combination, and has been appointed superintendent of the plant. The company's output comprises Hack Saw Blades in every variety, Butchers' Saws, Band Saws and Circular Saws for cutting cold metals and a Circular Saw machine of their own pattern.

WABASH SCREEN DOOR COMPANY, Memphis, Tenn., Chicago and Minneapolis, have issued with their compliments a photograph entitled "'A Few of Them,' as They Appeared at Memphis en route Chicago-New Orleans, November 18, 1902." This reproduces the party which made the highly enjoyable trip to New Orleans on the "Chicago Special," to attend the joint conventions of the National Hardware Association and American Hardware Manufacturers' Association.

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OUTLOOK FOR AMERICAN HARDWARE IN GERMANY AND AUSTRIA.

FROM a correspondent in Germany we have the following advices, sometimes in a facetious vein, in regard to the opportunity for the sale of American Hardware in Germany and Austria. The advices given do not refer to Hungary, which differs radically in language, customs, &c., and requires to be considered separately:

In considering whether or not a certain district would offer a good market for the lines made by American manufacture, the better way is not to devote space to the wants, irrespective of whether or not American makers can fill them, but to run over the lines which Americans offer for sale at home, and comment upon their appropriateness for the foreign trade.

Starting on Files—there is at present little use in offering the machine cut and none at all in sending the hand cut product. Metal Hack Saws go well, because the American are better than the German, and cheaper. The market for Unenameled Stamped Ware is gone; enamel is the word, and as most such wares have handles and take too much room in packing, they had better stay at home. Meat Choppers or Hackers with rotary cutters are already so much imitated, both with and without American names, that further efforts might be spared. Door Checks are a good "going" article, much more so than at home; it is a question of price. Lawn Sprinklers would not pay.

Bread Knives, with serrated edges, give too much trouble in sharpening; on the other hand, bread cutting machines that would "knock down" for transport and that would cut the tough rye bread and pumpernickel, one slice at time, ought to sell. The German demands a Door Lock that will shoot twice, and with a good substantial Key, and might as well have it; it would pay to make it for him only. For his purposes there is just as much security in crooked key holes as in complicated wards. Key Locks without posts are the rule.

Yankee Tools, consisting of a hollow handle containing several different Bits, go slowly. Patent Screw Drivers are too far ahead. Petroleum and Alcohol Stoves for cooking from a quart to a gallon at a time sell like hot cakes. Household Refrigerators would be a drug in the market, even if sent over flat. There is no place for them in the average German dwelling, and the average German housewife sends out and gets her perishable supplies just before using them. Further, she boils all milk at once when received, because she fears microbes, so there is no use putting that on ice. And as to ice water—or any kind of water—there is a proverb, *Wasser macht blaue Därme*, "Water makes the bowels blue."

Stove Lifters would not bring a dollar a ton. Tubular Lanterns perhaps might succeed. Hand Power Horse Clippers, if light and well made, should go well. Safety Razors are already introduced and imitated. There is a new "Celluloid" Razor Strop that puts on a sharp rough edge, but I think our Horse Tail Strops are better. Step Ladders might go well if shipped flat, because our wood is better than the German.

Cash Recorders take like wild fire; there are already several imitations of our best ones, and plenty "just as good." All hunting implements and supplies ought to take well, but somehow the Cartridge and Gun men seem to have neglected the field. Ice Skates would go well in North Germany. Footballs and such athletic goods would not pay. They are brought from London, and there are German Tennis Rackets, &c., which cost only half as much and last only one-fourth as long.

Fishing Tackle should stay at home, where people can fish without getting one general license as a fisherman and another special one for each place. There are plenty of German Coat Hangers and Trowser Stretchers, and there is room for more. There is not a Chafing Dish in either Hanover or Dresden, and I do not know any Germans who ever saw one. Gridirons do not exist; we of the "colony" get them made to order after detail drawings, and if the cooks do not threaten to leave we can gradually get them used. The best Jet Torches and Jet Lamps for plumbers come from Sweden, and are much counterfeited. Good Can Openers might go. As there are no Sliding Sashes, Sash Fasteners could not be given away.

Box strapping with Nail holes, if patented here, ought to pay well. Monkey Wrenches of good quality could hardly hold their own with the poor ones here sold, and which are hardly fit to throw at a cat. "Fox Tail" Saws —*i. e.*, our ordinary Taper Hand Saws, are not liked by workmen; amateurs use them, but there are not many amateurs in the carpentry line. Twist drills are good sellers, naturally there are German ones, but the good ones are dear, and this is especially true of left handed ones.

Bicycle Wrenches and such stamped articles are eagerly bought. Post Drills are too heavy and are commencing to be imitated. The same with Vises. Bolt Clippers are falling off, owing to the introduction of native manufactured goods. I think that Shoemakers' Outfits would take well; Shoe Polishing Outfits certainly. Harness Repairers, with Punch and Anvil, &c., in one apparatus seem likely to go. Sash Balances, for the same reason as Sash Fasteners, would be laughed at.

Carpet Sweepers are sold here, but there are no floors in Germany that are carpeted all over and many are devoid of any covering, being of well-waxed and polished quarter oak. There are fewer mice than with us, because there is less material kept in the pantry than with us, and the houses are more substantial. That is, the old ones are. Their new ones are a little bit "Jerry built," too. Filters would be "dead ducks." Fly Screens ditto; there are few flies here, for the same reason that there are fewer mice. Revolving Belt Punches should meet with ready sale if not dear. Cabbage Corers, certainly. Metal Polish, it depends entirely on the price. This the land of shining metal work.

Dripping Pans would be flat, as would be all sorts of household oven appliances. Self Feeding Stoves are commencing to catch on, but the German ones burn out soon at the basket and have given the idea a black eye. Further, nearly every house has the porcelain tile Stove abominations built in at first; and these last world without end. They are swept out every three months by the duly ordained city sweeps. Ventilators, never in the world. Faucet Oil Cans should sell well. Spring Butts are already on the market, and if heavy should go well.

"Mr. Sad's Pot Handled Cold" Iron would not sell; the correct thing here is internally fired. Carborundum and similar Whetstones are liked. Pressed Steel Brackets ought to be a very good export article. Mincing Knives still better, if the price were right, which I doubt.

Door Holders that would not score the floor might take; the experiment should not be an expensive one. There are gas lighters using pellets of platinum sponge and the like, retailing at Mk. 1.50, or 36 cents, and much liked by those who have Welsbach, here called Auer Burners.

THE WILKE MFG. COMPANY.

THE WILKE MFG. COMPANY, Anderson, Ind., in an illustrated catalogue call attention to their cypress, crystal and porcelain lined Coolers for cold storage in markets, groceries, hotels, restaurants, bars, wine rooms, creameries, steamships, &c. When desired a provision compartment lining of ½-inch etched plate glass, laid in special cement, is furnished, or with walls of white glazed tile cemented and assembled. The floors are covered with cypress or Mosiac ceramic tile laid in cement on concrete. The method of assembling the glass, insulation, circulation of dry air, preservation of cold air and other special features are set forth in detail. A number of illustrations, including sectional drawings, are given to make clear the principles of construction.

Manufacturers' Forecasts for 1903.

We give below extracts from letters from manufacturers relating to the prospects for next year's business as seen from their standpoint. These letters are from representative manufacturers in various branches of the trade and are in reply to an inquiry not only in regard to the outlook in general but especially as to whether there are any indications of any serious let up in the demand. The almost unanimously hopeful tone of the letters is significant:

From Manufacturers of Carriage and Wagon Forgings:

We do not look for any serious falling off in the demand for Carriage Forgings. It looks as if the consumption would be about the same next year as this. The demand last year was considerably greater than this year. We are informed that jobbers of Carriages have considerable stocks on hand in many of the Western cities, and while there is every indication for a good trade, stock orders for Carriage Forgings and other supplies will not be given quite as early this year as usual.

From Manufacturers of Chain:

We are inclined to think that for the first six months of next year, at least, business will be very good. As you are aware, the railroads have contracted for practically the entire year's output of rails. The car works have sufficient orders booked to run them at least nine months; the locomotive builders are sold for the year, also the structural iron and plate mills are sold up for months to come. The other lines of business are not in this condition, but with this fact in view there is enough business booked practically to give us good times for six months to come. We do not wish to say that we are going to have any boom period, or that prices will go up, but we think prices will remain stationary and that there will be a good, steady volume of business, at least until next July.

From Manufacturers of Tools:

The prospect for the coming year, so far as business is concerned with us, looks to be prosperous. We have quite a number of orders in hand for delivery after the first of the year, but attribute these to the fact that we have been so far behind in the past they wish to get a place and have given us their orders long in advance of their wants. We believe, however, if goods could be easily obtained there would be a decrease of orders. From our standpoint we feel that business has reached its zenith, and that if there is any material change after January 1 it is likely to be a decrease rather than an increase.

From Manufacturers of Hardware Specialties:

We do not see anything in the way to check the present volume of business for the first six months of the new year. The conditions for the last half of the year will depend largely on what the crops promise to be and on the market at that time for raw material.

From Manufacturers of House Furnishing Hardware:

The prospects for business next year, so far as we can see, seem to be favorable, although there appears to be a tendency on the part of the jobbers to go rather cautiously in ordering goods. The impression seems to be that the top has been reached in the way of prices.

From Manufacturers of Files:

The outlook is, as far as we are concerned, very bright indeed. We are at the present time at least three months behind on our orders in spite of the many additions we have made from time to time to our capacity.

From Manufacturers of Glue:

We prefer not to make any guess about the future of trade. We really know nothing about it, and all that we can say is that it is good at the present time.

From Manufacturers of Wire Work:

The outlook for good business next year is all that we could wish for. We have on our books orders that we will not be in position to fill for three months or more, while on our general jobbing line the business prospects for 1903 are good, yet we fear that the margin of profit will be small by reason of the jobbers in Wire Goods endeavoring to secure contracts for delivery in spring of 1903. This advance solicitation encourages the average jobber to cut prices to such an extent that there is no profit in the line for any one. We believe that the demand for seasonable goods will be on the increase during season of 1903.

From Manufacturers of Builders' and Miscellaneous Hardware:

From our standpoint prospects for business next year are good and we see nothing ahead to curtail the demand. Especially in Builders' Hardware, we believe there will be a greater demand than even this past year, and it looks as if it will extend well into 1904.

From Manufacturers of Edge Tools:

We look for an unusually good demand during the first half of next year, not only because of the unusual activity in the building trades covering ordinary construction, but also because of the large number of public improvements already under way, as well as those in contemplation, and we are making preparations accordingly.

From Manufacturers of Files:

The outlook for Files for the next six months we consider very good, inasmuch as we are almost covered for orders for that period at present prices. We are not quite sure how the material will be, but we have sufficient on hand and in sight to last us six months. We do not expect any labor troubles in the spring, which is the time they usually occur, and hope that the South American embroilment will not be more serious than at present, and that European monarchies will understand that their "war endeavors" will have no effect on the Monroe Doctrine.

From Manufacturers of Strap and T Hinges:

The demand for goods is very encouraging for this season of the year and the outlook for spring business is better than it has been for two or three years past. The only discouraging feature of the situation is that, owing to active competition, prices have been brought down to cost.

From Manufacturers of Belting:

It seems to us that the general condition of business to-day, after the tests to which it has been subjected this year, is such as to inspire us, not with overconfidence, or the idea that it is going to last anyway, but to work intelligently and thoroughly with the confidence that we shall successfully meet any uptoward conditions. Therefore, the general prospects for business next year seem to us bright.

From Manufacturers of Hardware Specialties:

We must confess we are not equal to making any forecast as to next year's business. We are busily engaged now in trying to get hold of what trade we can and are not unduly anxious as to the future.

From Manufacturers of Mechanics' Tools:

Sales during the six months show quite a material increase over same time last year. Future looks bright and we see no indication of any let up.

From Manufacturers of Pumps:

This has been a very busy year and our business was larger than any year before and we expect a still further increase in our trade next year, as we are now providing additional facilities in the way of new buildings, machinery, equipment, &c. From our standpoint

the outlook for next year appears to be very bright and we see no indications of any let up, although business just at this time is a little quiet, as is usual with us at this time of year.

From Manufacturers of Wrought Iron Hinges, Butts, &c.:

From our present standpoint there is every indication that there will be no letting up in the demand for goods for the first six months at least of 1903. We are planning our business on this basis.

From Manufacturers of Plumbers' Supplies:

The excessive demand for goods in the construction line is the wonder of our trade, and as we are at the present time all the way from four weeks to six months behind our orders, we can hardly say that we think there is any let up; yet, at the same time, as we cannot see a good reason for the excessive demand, we should not be surprised at any time to have it cut off entirely.

From Manufacturers of Wire Products:

We think the general prospects for business in our line for the first half of next year are first class. Everything points to a good business next spring. The absorption of the Union and Sharon Steel companies by the United States Steel Corporation will lend a wonderful influence in stiffening up the Wire and Nail market; in fact, the influence is already being felt. This fact, coupled with the great demand for Wire products which we are bound to have in the spring months, will, we believe, cause such a demand that the factories will be taxed to their utmost to supply the spring want.

From Manufacturers of Tinware:

We believe the prospects for an immense demand for next year, certainly the first half of it, are excellent. A good many things have occurred lately which have a steady and encouraging influence, and we believe that the result will be a steady demand with continued shortages in many lines.

From Manufacturers of Castings, &c.:

We are just closing the most prosperous year of our company. As far as we are concerned, we see no reason for a let up in next year's business. We have a number of contracts on hand, and feel confident of a continuance of the prosperous times through at least another year, if not longer.

From Manufacturers of Firearms:

From our standpoint the outlook is quite satisfactory.

From Manufacturers of Tacks:

While it looks to us as though there was more uncertainty than has prevailed for the last year or two, we hardly feel that there are indications of any serious let up in the demand during the coming year.

From Manufacturers of High Grade Bolts and Nuts:

So far as we can see, there is no prospect of any cessation of business in the near future. The outlook is very promising, as inquiries are being received by us from all over the country, many of them asking for deliveries next year.

From Manufacturers of Shovels and Spades:

So far as we can see, business for 1903 will be fully equal to that of 1902. We also think that it will be very hard for manufacturers of Sheet Metal Goods to obtain their supplies promptly, and, therefore, shipments of orders will be very much delayed.

From Manufacturers of Stocks and Dies:

Our view of trade for the coming year is that we shall see a gradual decline from the past year, but not to any serious extent.

From Manufacturers of Pipe Cutting and Threading Machinery:

Prospects for next year's business are very bright. The past year's business has been the largest in the history of our company, and we expect to equal it, if we cannot better it, next year. There may be a slight falling off in demand, but we think this can be met by increased energy. We think the volume of business next year in the machinery line in general will be perhaps as good as it was this year, but it will take a little more work on the manufacturer's part to get it.

From Manufacturers of Brass and Copper:

Business always drops off the latter half of December, but we are busier than usual at this time of year and have as many orders for future delivery. We always look for hard times about once in so often, and we expect a depression after a boom. We see no signs of a curtailment of business as yet.

From Manufacturers of Refrigerators:

We are getting our full share of business at present and, so far as we can see, business in our line promises to be as good as, or better than, last year.

From Manufacturers of Rules:

While the demand for our class of goods during the last 30 or 40 days has dropped off somewhat, still we have more orders on our books for January, February and March shipment than we ever had before. This would indicate that our customers feel rather hopeful as to the demand for goods in the coming season, and we are preparing ourselves for an even larger business than last year.

From Manufacturers of Horse Nails:

The prospects are for a greatly increased business for this company next year. There is no indication whatever of a let up in demand. On the contrary there are many indications of an increased demand, both in this country and abroad.

From Manufacturers of Farm Implements:

The outlook for business the coming year is very good, we already having in hand on orders for spring trade about 55 per cent. more business than at the same time last year. We do not see any indications of a let up in demand very soon, and there is not apt to be much diminution as long as the farmers secure as good prices for their crops as they are now doing. The wet season, of course, has ruined the crops in some sections and made collections rather slow, and the prospects of a large business another year are rather doubtful. However, looking at the territory as a whole, we see no serious let up.

From Manufacturers of Picture Cord:

Our opportunities for observation are not extended, but we notice no falling off in the demand for the line of goods we make. While the buyers look for lower prices, we have observed that any advance, even the prospect of an advance, has brought orders, willingly placed, for future delivery to cover quite a period. We do not want to say that conditions in the Wire trade will be somewhat altered by the new mills which will be in operation before the close of 1903, but the trade will look for changes then and we expect a tendency to "hold off" as we approach the season for stocking up for fall by the trade.

From a Large Manufacturer in New England:

I have just returned from an extensive trip, and, while everybody is busy, it seems to me that things are getting into such shape that we cannot look for any such increases as we have had. While everybody is hoping that things will keep up right along, I have a feeling that we have got to high water mark, and that the tendency will be down. While I do not see anything serious in relation to a let up, it does seem as though there is going to be a snugging up in quite a number of places, which is bound to curtail business somewhat.

From Manufacturers of Hardware Specialties:

The outlook for the coming year is very favorable. Orders are now coming in for spring goods, if anything earlier than last season, and as a rule for larger quantities, and in many cases for earlier shipment than for corresponding orders last year. We see no indications of serious let up for the demand in our goods.

From Manufacturers of Wire Cloth:

The fast pace set some two or three years ago has been constantly accelerating, and so far as we can see

the end is not yet, nor do we find any indications of a lack of confidence on the part of the buyers. Orders are made on a liberal scale, and the goods seem to move with equal facility into the hands of the consumer. Prices are firmer than last season, but do not show an inordinate profit. Collections are on a basis of discounted bills by what may be regarded as first-class houses—and this in the face of a tight money market. On the whole, we regard the situation favorable for satisfactory business the coming season.

From Manufacturers of Firearms:

It is too early for us to speak positively of our business for next year, but the late orders for this year are holding up much better than usual. We are also carrying over quite a good many unfilled orders, and there are no stocks of our goods in first hands. We have also booked orders for a large percentage of our output for next year, and we expect and believe that the demand in our line will be heavier than ever. We see no indication of any serious let up. Our difficulties are at the other end of the line. Shortage in coal is the most acute ever known, and we are practically burning anything we can get hold of. Deliveries on steel are no better and quality is worse. Other materials and supplies are slow in coming forward; prices are high and quality low. These all tend to increase the cost and restrict the output. Under these conditions it is not possible for any considerable stock to accumulate in the next six months.

From Manufacturers of Shovels and Spades:

We are looking for a very large business in our line during the coming year, at least for the first three or four months, business during the latter part of the year depending considerably on the condition of the crops. We have never seen business in our line in better condition than it is at the present time, and have booked all the orders that we can turn out for several months to come. The business throughout the entire West and Northwest, especially on the Pacific Coast, is as fine as could be desired.

From an Ohio Manufacturer:

Present indications point to fully as large business with the Hardware trade as we enjoyed during 1902. In other words, we think the outlook for next year's business is flattering.

From Manufacturers of Wire Cloth, &c.:

Prospects next year in our line especially look very bright. We see no indication whatever of any let up in the demand; in fact, it seems rather otherwise. All the manufacturers in our line have their products placed for next season. The question to us appears to be one of delivery rather than of demand. We look for larger business than ever. We are turning down orders every day.

From Manufacturers of Hay Tools, Pumps, &c.:

We cannot help but believe that the requirements from the consumer because of his very prosperous condition will continue for some time to come, and that the volume of business will be correspondingly heavy. The immense crops are bringing a good price, making the buying power of the farmer equal to, if not greater than ever before in our history. The fact that he has money, debts well paid and is encouraged stimulates improvement all along the line, requiring an immense quantity of goods, especially in the Implement line for the securing of water, hay, grain, fruit, &c. Being loaded with orders to our fullest capacity, which have been increased by large specifications of late that will keep us fully employed for months to come, and with prospects in line with the very encouraging conditions, we cannot help but believe that trade will keep up, and while there may be a few slight breaks, we will recover promptly and should have encouraging conditions for a year or two to come.

From Manufacturers of Castings:

In our business we do not see any indication of a let up in demand. We believe, however, that there will be a slight falling off in the bulk of trade next year.

From Manufacturers of Light Chains;

We would venture a guess that the coming year will show no let up in the general proserity, but are positive that the first three months will show quite a liberal increase in our sales, as proven by our having booked large advance orders for early spring delivery.

From Manufacturers of Horse Nails:

Our impression, gained by our intercourse with our customers and all we do business with, is such as to lead us to prepare for a large business the coming year. We think business men everywhere have confidence in each other and want this confidence to remain undisturbed.

From Manufacturers of Shelf Hardware:

The situation in our case is reflected by the fact that we have booked a number of good orders for delivery shortly after the first of the year and are receiving notwithstanding a very considerable number of sort up orders from these same people for shipment at the present time. This, of course, would indicate that stocks are low and that the demand is more nearly constant than is usual in Shelf Hardware at this time of the year. One contract for a specialty that we do not advertise at all, but are in the habit of furnishing in considerable quantities to a very few jobbing houses, we closed at an advance of 15 per cent. in price over that of last year. Last year it was difficult to get the parties up to the quantities contracted for this year.

From Manufacturers of Agricultural Implements:

The indications are that there will be a large trade in our line during the coming season. Instead of there being any indications of falling off, it rather looks as though the demand might exceed the supply.

From Manufacturers of Bolts and Nuts:

We notice a little change in the character of the demand, but no serious decline. The orders seem to be smaller in quantity, but more numerous, and immediate shipment is required. We look for a continued satisfactory business in volume, and see no reason for a material reduction in price.

From a Manufacturer of Twist Drills:

The business outlook seems particularly bright and there seems to be stability about it which is most encouraging.

From Manufacturers of Lawn Mowers:

Our orders for next year up to date show an increase of over 60 per cent. on the same date last year. In part of our territory our orders equal to date the entire last season's business in the same territory; but it is hardly fair to presume that this large increase in our orders indicates a proportionately large increase in the entire business of the coming year. Part of it is due to the fact that last year we were unable to fill our orders on account of the increased demand and our inability to get material when we wanted it. I think also that a large amount of it is due to another fact, that nearly all of our customers sold nearly all the goods they had on hand in our line last year and were unable to get goods from us when they wanted them, which was an incentive for them to place their orders earlier this year and in larger volume than in previous years, but, notwithstanding these facts, our orders indicate that our business for the coming year will be larger than any previous year. The only trouble we anticipate will be in getting material delivered promptly.

From Manufacturers of Mechanics' Tools:

We do not see any indication of any let up in the aggregate volume of business. We believe there is a large consumption of goods in our particular line and that the retailer is particularly busy, and that his demands upon us come earlier and oftener than the demands from the jobbing trade. We do see a let up in spots. Certain particular customers or classes of customers are not buying as many goods. In view of all the circumstances of which we have knowledge, our opinion is that this can be accounted for because of the season of the year and therefore it should give no cause for

alarm. There is another point, however, which is not always considered, which is that every factory is straining its productive capacity to the utmost, and while probably in no individual instance have the factories a large stock of finished goods, yet we think you will find almost without exception an immense stock of parts in process, and a curtailed demand for even a short period would seen fill the shelves. Just what effect this would have upon general business would depend upon the action, individually or concerted, which might be taken by the various Hardware manufacturers. A rush and scramble for trade would have a bad effect, to say the least. If the matter were handled wisely and well we do not think anything more than a temporary setback might be looked for. The prosperity of the country is certainly general, crops have been good over a long period, the purchasing power of the masses is large, and the wheel of consumption is turning rapidly, and it will tide us over a considerable storm if the steering gear is properly handled.

From Manufacturers of Steel Ware:

We think the general prospects for next year are good. We do not believe the jobbers have a very large stock on hand, as they have been purchasing only their actual requirements for the last year. There has been very little stocking up, as the steady prices did not warrant the jobbers to be speculative in their purchases. The price on the majority of manufactured goods is not high, in fact not as high as present conditions warrant. There has not been that increase in the selling price proportionate to the increase in labor and raw materials.

From Manufacturers of Hardware Specialties:

The outlook for future business looks exceedingly bright. We are very busy and unable to fill orders with our usual degree of promptness.

From Manufacturers of Pumps and Pumping Machinery:

It is a little difficult for us to forecast the future at the present time, as this is a little out of season for our business. So far as we can judge there will be no marked falling off in trade during 1903 in the machinery world. We think prices will rule a shade lower. Inquiries are coming in very freely considering the season of the year and indications point to a large amount of new work for the early part of next year.

From Manufacturers of Skates:

We are so very busy with our seasonable business that we have given little thought to the future, but from our standpoint have no reason to look for anything but a continuation of the prosperity of the past few years.

From Sheet Metal Workers:

There is evidence on every hand of prosperity in all lines of legitimate business, without any apparent reason why present conditions should not only continue, but increase through a year or more to come. It does not seem probable that the tariff will be meddled with sufficiently to unsettle present business or discourage investment in new enterprises. There are, however, reasons for fear of disturbance, not only of individual establishments, but of the whole country, by the power that is getting into the hands of labor leaders. If manufacturers are to have their plants closed and picketed so that they cannot employ whom they think best, they will be very likely to find it unprofitable to try to do business and will close up and quit rather than continue the risk of capital under the dictation of irresponsible labor leaders.

From Manufacturers of Pocket Cutlery:

So far as general prospects for business for 1903 with us are concerned they are encouraging. We are inclined to believe that there is a shadow of fear in the minds of some buyers of a depression of business in general, but we do not think that this amounts to much. Our sales for 1902 increased, say, 30 per cent. over sales for 1901, and we are in hope of making another gain in 1903, if we don't run up against any disturbing legislation.

From Manufacturers of Metal Specialties:

We notice no dropping off in business and prospects for next year look bright. We, of course, at this time of the year expect some let up and generally get it, but this year we carry over more orders than ever before. A change in the price of materials now going on would certainly affect trade. With steel $10 per ton lower than in 1901, brass 30 per cent. lower and a drop of 50 cents per box in tin, the future is bound to be affected, as it creates a feeling of fear in the mind of the buyer. Personally we do not anticipate much trouble, as we know the conditions that bring this about, but our customers do not, and, worse than that, some of our competitors do not seem to.

From Manufacturers of Firearms:

The prospects for business with us seem to be very bright for the coming year. Possibly there may be a lull during the middle of the year, but it is impossible to foresee this at the present time. We are now extremely busy on all lines, being rushed to our fullest capacity.

From Manufacturers of Shears:

We do not see anything in the distance to interfere with business for the coming year. Trade during the present year has been exceptionally large, in fact the largest that we have ever experienced, and from all that we can gather, we can see no reason why next year should not be just as good.

From Manufacturers of Cast Iron Hardware:

On the whole the general prospects for business next year look favorable, and judging from the present demand and difficulty in getting material, it does not seem as if there will be a let up in the first half of the year. It seems to be a legitimate demand and not speculative, which puts it on a sound basis. The approach of the Presidential election and its agitation might possibly make some difference in the business situation, but we cannot see why we should not have another year like 1902. Conservative business men are proceeding cautiously and all anticipate a let up eventually, and we believe that most people are prepared for it, which would indicate that as we grow older we grow wiser. The disposition on the part of the Government to curb the evils of the trust situation will assist materially in keeping business within safe bounds and also invite further confidence in the President and the administration.

From Manufacturers of Wagon Hardware:

At this time of the year about the only barometer we have for judging future business is the expectations of our customers, and we have never at this season of the year found our customers feeling more certain of a good year's business ahead of them than they do now. What the year may develop as it goes along, of course, is entirely problematical, but if we can judge anything from the feeling of our trade as they explain it to us we certainly shall have a very good business during the coming year.

From Manufacturers of Lawn Mowers:

We have already booked two-thirds of all the business we can possibly do until our season closes next June. We are obliged to refuse to quote new trade, fearing that we shall be unable to fill their orders should they place them with us.

From Manufacturers of Files:

The general prospect for business for 1903 is very encouraging, and we feel confident that the volume of business will be just as large as during 1902. Speaking of our business in particular, we anticipate a large increase during 1903, as the orders on hand at present are far in excess of the supply and goods are being bought for consumption and not for speculation.

From Manufacturers of Twist Drills:

The demand for our class of goods has been this year very large and we have been pushed to our utmost capacity to fill orders. It seems to us that until the present prospective enlargements of the various manufacturing interests throughout the country are completed

the demand will continue to be good. Possibly the manufacturing industries of the country have risen to a higher plane, where they may stand for some few years before any further great enlargement takes place. We are not looking for any less demand for at least the coming year.

From Manufacturers of Machinists' Tools:

So far as we can see the prospects for business next year are very encouraging. We are receiving inquiries for large quantities of material that would necessarily be delivered the early part of next year. In our line of finished goods there is the usual hold up on orders, which we consider as owing to its being near inventory time.

From Manufacturers of Saws:

So far as we can see nothing darkens the horizon in our line of business. The present year has been remarkable for the way in which the demand for goods has kept up so late in the season, and we have already received numerous orders for shipment during the new year. The lumber business seems to be all right, and we hear of a great deal of building and contracting for the new year, so that it appears to us that there will not be any less demand for our goods during the first half of 1903 at any rate.

From Manufacturers of Sash Weights:

We hope for a continuance of the present prosperous conditions, and the following reasons, we think, will be strong factors in maintaining present prices and demand: First, foundry coke will be 100 per cent. higher in 1903 than in 1902, and even then you must sign a contract. Second, raw material in our line has advanced in some cases as much as 300 per cent., and can only be bought on a year's contract. Now as to demand, we are dependent upon prosperity in the building line, and a few weeks ago I visited 20 real estate offices with the following result: 16 had no houses for sale or rent, three had houses for sale (all rented), and one had one house for rent. This covered an area of our city that has always had many empty houses. From this I concluded that houses were not being built rapidly enough to keep pace with the increase in population and the prosperity of the country, and that next year the builders would increase their operations. The increased cost of labor, fuel, supplies and raw material has about eliminated profit from our business and should there be a falling off in demand it would cause a very serious loss.

From Manufacturers of Pipe, Fittings, &c.:

In our line there are no special indications of any letting up in the demand. Of course we depend very largely upon the building trade, and this has obtained such momentum, not only in mercantile and office buildings but also in manufacturing plants, that we do not believe our business can be affected materially for the next six months.

From Manufacturers of Hardware in Connecticut:

We see no substantial reason why the prospects for general trade for the coming year are not as good today as they were one year ago. The Government is being administered satisfactorily to business men, and we think to the people at large. In fact, a much more healthy feeling exists among the rank and file as regards politics. People are not as partisan as they were formerly. In the South the asperities of the war have in a large measure worn away. The old Mason and Dixon line is done away with, and North and South are mingled together in business affairs, and the openings in the South for business enterprises are being recognized by capital. In the West good crops and good prices and improved transportation facilities have stimulated energies. Our new acquisitions—the Islands of the Sea—already feel the throb of American energy, and improved civilization will surely result in greater demands for our productions. The coal difficulty cannot last—necessity demands its settlement. Taking all the above into consideration, we think there is good reason to expect that our present prosperity will continue during the coming year, especially so in view of the assurance that no radical changes in tariff legislation or any other legislation that effects business men will be countenanced. In addition to this, there is sufficient encouragement to believe that in some way great combinations of capital or trusts will be regulated by legislation; their evils eliminated and individual enterprises protected. Our view may be thought to be optimistic, but we think there are good reasons for it, besides we think it is always well to look on the bright side, unless circumstances forbid it. It is always well to note the signs of coming changes, but not to imagine them.

From Manufacturers of Bolts and Nuts:

The outlook for business for the year 1903 from our standpoint is very encouraging. I can see no clouds to darken the business sky at present. The old saying that "if we wish to judge of the future we must take a look backward" is a good enough maxim in ordinary times, but the present times are not ordinary; they are exceptional in the fact that we have been passing through a period of such great developments that the iron and steel business has undergone almost a complete revolution, in which many other branches of business have participated to a greater or less extent. In agriculture, manufactures and commerce the whole country is enjoying its greatest period of prosperity, and I see no reason to apprehend a period of business depression, unless it should come from a serious failure of our crops or from loss of confidence in our financial situation arising from any other cause. Overspeculation or too great an enlargement of our manufacturing facilities might bring this about, but I see no prospect of disaster during the next year.

From Manufacturers of Scythe Stones, &c.:

All the manufacturers that I know of are crowded with orders, and many of them are running their factories night and day. The outlook for the coming year, I believe, is just as promising as it has been for the past five years. I know that some take a pessimistic view and say that the boom of prosperity is about over, that we will soon get to the end of our good times, but I can see no reason for it, except that it may be on account of overcapitalization of many industrial corporations, and that something may happen to some of the larger ones that will cause a slump in stock and create a panic. There is another danger to be feared, and that is from the unreasonable exactions of labor unions. I believe it is right for the manufacturing interests of the country to consolidate as long as they put a fair valuation on their properties and pay fair salaries to their officers and employees; that it is right to ask fair prices for their goods and to practice all the economy that they can from the consolidation of large interests, but when they pay large dividends on fictitious values, that is a menace and danger to the country. It is all right for labor to form unions and endeavor to get what fairly and justly belongs to them, but they must respect the rights of other laborers and of their employers. I believe that both of these things will take care of themselves in reasonable time without causing any serious disturbance. We are simply passing through a period of evolution which I believe will bring about a better condition than we have ever had.

From Manufacturers of Graphite, &c.:

We look forward to 1903 with hope for the good reason that the farmer is rich beyond all previous expectations, the wage earner is also in better condition than ever before, with large and still larger wages. Add to this the fact that the whole people are good spenders and reasonable savers, with every one money in pocket and prospectively more money to come in regularly, how can the pace slow up? We regret the unintelligent clamor against the so-called trusts, and our further advice as far as Government policy is concerned is, let the tariff alone.

From a Large Ohio Manufacturing Concern:

The present condition of our business and outlook for the coming year is better than at any other time in our history. We are just completing additions and changes in our shops which will increase our capacity

fully 25 per cent., but we expect to have it tested to the utmost during the coming season.

From Manufacturers of Files:

As to the general prospect for business next year there would seem to be nothing in the industrial situation but what gives promise of a good year's business in 1903. Many concerns have orders booked that will keep them busy a large part of that period. Nature continues kind to us, yielding bountiful crops; the great carrying railroads of the country are short of motive power and cars and there is no evidence of a let up in the volume of freight moving. The wonderful development in most lines of business since 1898 has given such a momentum to the manufacturing industries of the country that one can hardly believe that any possible conditions can so seriously affect business that the record for the coming year will not be a good one, and we hope to be able to say at its close, the end is not yet.

From Large Tool Manufacturers:

As far as every-day indications go there is nothing to denote any serious let up. The past year has been a steadily busy one, continuing so even to the end. Nevertheless we feel the excessive activity of domestic business of late, together with other notorious indications, point to a let up in the not distant future.

From Manufacturers of Cutlery:

From our standpoint the outlook is very flattering. We have received more inquiries from the trade than usual, and more letters desiring our representatives to call than we have ordinarily received at this time of the year. Collections are good, which is indication that goods are moving, and I have always noted that when collections are good the prospects for future business are bright. A lively dollar is productive of good business. We are also booking some very nice orders for early spring delivery, and the reports coming from all sections is that business will be good the coming season.

We are adding very largely to our productive force in anticipation of a large increase in our business the coming year.

From Well-known New England Manufacturers:

Our business is almost exclusively with manufacturers scattered through a large portion of the Eastern and Middle States, together with the Hardware trade on certain lines of our production, and orders seem to be keeping up fairly well for this season of the year and there is every indication that we have a bright and prosperous year ahead of us.

PRICE-LISTS, CIRCULARS, &c.

THE GOODELL COMPANY, Antrim, N. H.: A pamphlet is devoted to description and cuts of Silver Plated Knives and Forks. Another pamphlet relates to their Cahoon Seed Sower.

THE AMERICAN MFG. COMPANY, Arlington Heights, Ohio: Illustrated pamphlet devoted to a description of the Sprung Washing Machine.

THE ASPINWALL MFG. COMPANY, Jackson, Mich.: An illustrated catalogue is devoted to Potato Cutters, Sorters, Planters and Diggers; also Sprayers for potatoes, cotton and asparagus. The Cotton Sprayer and Asparagus Sprayer, which latter is a modification of the Cotton Sprayer, are the company's latest machines.

ACME WHITE LEAD & COLOR WORKS, Detroit, Mich.: The December issue of "Spatters" contained matter of interest to employees as well as friends and customers of the company.

RODERICK LEAN MFG. COMPANY, Mansfield, Ohio: Illustrated catalogue relating to Harrows, Land and Corn Rollers, Hand Carts, &c.

THE PAWTUCKET MFG. COMPANY, Pawtucket, R. I.: Illustrated catalogue devoted to Bolts, Nuts, Washers, Chain Links, Carrier Chain, Turn Buckles, Bridge Rods and Straps and Irons for buildings. A number of pages in the back of the book are devoted to illustrating the many special Bolts manufactured by the company.

THE JOHN DUNLAP COMPANY, Pittsburgh, Pa.: Catalogue illustrating Colored Enameled Ware, Deep and Shallow Stamped Tinware, Tinners' Trimmings, Pieced, Heavy Polished, Copper, Japanned and Galvanized Ware, Wire and miscellaneous goods.

THE KEELER BRASS COMPANY, Grand Rapids, Mich.: Catalogue illustrating Metal Furniture Trimmings of Cast and Sheet Brass, including Drawer Pulls, Knobs, Escutcheons, Hat Hooks, Toilet Pins, &c.

THE BUCKLEY-HART MFG. COMPANY, Detroit, Mich.: Catalogue illustrating Lawn Sprinklers of many styles, Hose Couplings, Menders, &c.

QUEEN ANNE SCREEN COMPANY, Burlington, Vt.: Catalogue illustrating 1903 Screen Doors and Window Screens. Both lines of goods are shown in a variety of styles.

FRANK & DE KEYSER, 174 Fulton street, New York: Bathroom and Lavatory Furnishings, Match Stands, Ash Trays, Cuspidors, &c. These are shown in an illustrated price-list.

H. B. SHERMAN MFG. COMPANY, Battle Creek, Mich.: Illustrated price-list containing Hose Brass Goods, including Couplings, Sprinklers, Pipe Nozzles, Menders, Hose Clamps, Nipples, Reducers, Reels, Brass Pump Cylinders, Pump Leathers, &c.

THE KEYSER MFG. COMPANY, Chattanooga, Tenn.: Odorless Refrigerators and Ice Chests of solid oak. These are shown zinc lined, white enameled lined, and nickeloid lined, with odorless circulation, in a variety of styles and sizes.

THE UNION BRASS & IRON WORKS, Detroit, Mich.: The Union Hose Nozzle. A circular illustrates and describes the Nozzle.

INCANDESCENT LIGHT & STOVE COMPANY, Cincinnati, Ohio: The F. P. Lighting System. An illustrated pamphlet is devoted to a description of the system.

THE STANDARD PAVING COMPANY, 22 Clinton street, Newark, N. J.: Schouler's Sanitary Stall Floor is illustrated and described in a pamphlet.

THE LOWE BROTHERS COMPANY, Dayton, Ohio: Illustrated price-list of Paints, including liquid, ready made and household Paints, Interior Enamels and Finishes, Stains, Varnishes, &c. The company issue a pamphlet at intervals known as "The Little Blue Flag," containing Paint information and business facts for the assistance of their agents.

GRAND RAPIDS REFRIGERATOR COMPANY, Grand Rapids, Mich.: The Leonard Cleanable and Champion Refrigerators. These goods are illustrated and described in a 1903 catalogue, the Leonard Refrigerators being supplied with sliding adjustable shelves, as illustrated in another column. The Leonard system of Refrigeration and insulation is fully treated.

PRESENTATION TO JAMES A. FARLESS.

JAMES A. FARLESS, secretary of the New England Hardware Dealers' Association, who was injured by a fall some weeks since, and who is still confined to his home, 41 West Newton street, Boston, was the recipient of a handsome Christmas remembrance from the Hardware trade. James N. Frye of Frye, Phipps & Co., received subscriptions from the jobbing trade, including members in Providence, R. I., and Portland, Maine, and D. Fletcher Barber of Chandler & Barber, subscriptions from the retail dealers of Boston and vicinity, and the responses were so liberal that the committee were enabled to present to Mr. Farless on Christmas morning a purse containing nearly $500, as a testimonial of the esteem and affection in which Mr. Farless is held by the entire trade, of which he has been an honored member for 50 years. The presentation was made without ceremony, and Mr. Farless received it in the spirit in which it was given, being greatly affected by this practical evidence of the good will of his associates in the trade.

The Hardware Outlook for 1903.

In the following reports from correspondents throughout the country a mass of information is presented to the trade in regard to the condition which exists in the various States and Territories, relating to the prospects for business next year. These advices are from thoroughly representative retail Hardware merchants who have obviously excellent opportunities to judge of the state of things in their communities. It is gratifying to observe that on the whole the reports reflect satisfactory conditions and a hopeful feeling for the new year.

From Merchants in Alabama:

Farmers are not prosperous, and consequently have no money to spend. The increased iron production in the State has proved very beneficial to business. Labor is well employed, and a large amount of building is being done in our city.

The demand for building material seems to be greater than last year. Stocks are kept up pretty well. Collections fairly good. The indications for business in 1903 are good. The farmers through our country are all prospering, that work and half try, and the great majority work. There has been a vast amount of building all over Southeast Alabama, and our town has certainly had its share.

We think the coming year will be a fair one, although the present season has not been a prosperous one on account of drought, leaving farmers in poor financial condition. The prospect for building and new enterprises is good.

From Merchants in Arizona:

In this immediate vicinity, which is an agricultural and cattle country, business is not quite up to standard, owing to the fact that we have had several years of very dry weather, but in the past month we have had good rains, with a prospect of more, and the outlook is very encouraging, with a prospect of a prosperous season. In the mining districts of the Territory business is quite active, new mines are being developed and the outlook for the future is good.

Owing to the lack of rain for irrigation purposes, upon which we are entirely dependent for crops, the past year was a poor one. The prospects for the coming year are very good, as we have had two fine rains, and the water for irrigation has been more than enough for putting in the crops and starting them.

From Merchants in Arkansas:

The people in general are in a prosperous condition. Labor is well employed and at good wages. Cotton, corn, hay and fruit crops, which are the principal products of this country, were good; also prices. Our city has enjoyed a building boom the entire year, with a fair prospect of it continuing. Business outlook for 1903 very good. We have some drawbacks in the country. Hogs are very scarce and very high, and but little wheat raised in this country this year. All other conditions are good.

Business has been very satisfactory since September 1, much better than last year. Our customers are getting over the effect of the partial failure in crops of 1901. Labor has been fully employed during all of 1902, and everybody has money, except the lazy or people that have had some misfortune. Stocks in hands of merchants are fairly well assorted, not overstocked nor depleted. Collections are not quite as good as might be expected. The majority of the farmers are in a good financial condition. Cotton and other products bring a good price, and there is nothing in sight at present to prevent the coming year from being a prosperous one.

From Merchants in California:

The outlook for business in 1903 is very good, providing our section of the country will raise an average crop. Our business is dependent entirely upon the size of the wheat and barley crops. In 1901, with a crop above the average and low prices prevailing, our business was the largest in the past ten years, and the present year, with a crop below the average, but prices sufficiently higher to offset the deficiency in the yield, our business each and every month has exceeded that of the previous year. In my judgment, one of the best indications of prosperity in this, a farming community, is the exceedingly small percentage of loss in accounts that has prevailed the past few years. All the indications from a statistical standpoint are for fair prices for grain next year, and with only an average crop I should say that the business of 1902 should not only be equaled, but exceeded.

The past year has been fairly prosperous in Northern California, a large crop of fruit having been raised, which brought a reasonable price. A good crop of cereals was also raised, and, although the present advance in prices did not benefit farmers to any great extent, yet the advance has inspired them with hope and courage that the price will remain until next harvest. The season has been quite propitious, and I see no reason why the favorable conditions existing may not extend into the year of 1903, which from the present outlook promises well.

I have been scanning the horizon pretty carefully and cannot see any reason why there should be a falling off in business during the coming year. We have been particularly blessed during the past year or two with what might be termed a building boom, and it would take a year's good hard work to get everything closed up. I look for a continuance of prosperity on this coast for another year at least.

We look forward to a very prosperous year for 1903, and cannot see anything at present that indicates that the present existing prosperity should not last anyhow during the year 1903.

From Merchants in Colorado:

The oulook is very good for 1903. We have had quite a snow fall in the mountains, assuring water for irrigation, which has been denied us for the past two seasons. Business has been fair this year and we look for increased business.

The prospects for business the coming year are, I think, more promising than for some time. Recent snow falls, with what had previously fallen on the mountains, assure us a better water supply for irrigation than we have had for some years. New mining camps are being opened up near us, which will afford us not only direct trade, but a good market for produce of our farmers, thereby enabling them to buy more goods. There is now nothing to indicate any interruption of the existing prosperity save perhaps the very low prices of stock cattle, which we hope will improve in the near future.

In our line of iron and steel, Heavy Hardware and wagon wood stock business usually drops off from December 15 to February 1, so that it is rather difficult to arrive at reasonable conclusions prior to February 1. Will state that there is, and has been for some time, the impression among our trade and territory that a decline in prices generally is anticipated, and necessarily this

impression should result in a decrease of orders, some having put the limit of time for such decline to appear as early as June 1 next. These are impressions that are hard to remove, and, to say the least, result in buying "close to shore." Personally our impressions are that such pessimistic ideas will not prevail.

The only interruption to prosperity here is caused by the constant "knocking" of our principal product, silver. A continuance will cause complete stagnation.

Everything looks serene in this section of the country.

From Merchants in Connecticut:

Our people are more prosperous than in many years. Savings banks have largely increased deposits and labor is fully employed. It is almost impossible to hire labor for special work, while a few years ago the street corners were full of men ready for any odd job. Only those who will not work are idle now. The same condition prevails among the farmers as the city people.

Building for 1903 looks bright. Nearly all of our manufacturers plan additional buildings, and as it is impossible to find a desirable tenement in the city vacant, we look for a year of very great activity in the building line. We do not believe anything can stop us at present. Some manufacturers are contracting for larger quantities of raw material than ever before and they buy it to use.

Labor is well employed, the farmers are prosperous and the outlook for 1903 is good. The scarcity of coal has not yet caused any factories here to close, but individual consumers are compelled to live from hand to mouth, and this condition causes much anxiety.

We look for less business for 1903, as advanced prices for labor made by masons, carpenters, plumbers and several trades have interfered with building, repairs, &c. Labor is well employed, but no new buildings or enterprises have started lately. We feel conservative about 1903.

People fairly prosperous and labor well employed; very few idle. Farmers have had a good year in this vicinity. Very little new building proposed at the present time as the cost is too high. Several new trolley lines projected from this city which will help business very much.

The prosperity of the people is at its hight, labor is steadily employed, no good man being necessarily idle. The financial condition of the farmers is better than it has been in years. Building in 1903 in this section we fear will be light, due to the high cost of material and the continued demands of labor for higher wages. This factor will undoubtedly check building to a great extent in this section for the coming year. There is a feeling among the trade in this section that there will be some disturbance in prices between now and the opening of the spring trade that may have a tendency to make buyers cautious. On the other hand, the general advance in wages, the high cost of raw material and the increase in freight rates would indicate that the chances for any serious decline in prices are remote. The situation taken as a whole, as we see it, indicates a continuation of good business for some time to come.

From Merchants in Delaware:

Trade for past six months has maintained the promise of a "good trade all year." Judging by our own trade, 20 per cent. will hardly cover the increase. This has been a good year for the farmer in our vicinity. We have had good crops, and prices have been good. Our corn went into market at 46 cents, which is considered a good price, while our sweet potatoes are in demand at prices to pay the farmer to raise them, and many are now going into market. We can tell by the quantity of money, and knowing from whom it comes farmers must be doing well. Our stocks are heavier than usual at this season, and collections have been better this year than for many years, if ever so good before. Bank deposits are large.

The people are prosperous and labor is well employed. One of the railroads is building elevated tracks, freight stations, passenger stations and shops. Aside from this a number of large factories are now being erected, or will be soon.

Our people are prosperous and all are employed, and at increased wages. The farmers have had good year, and their output was large. Two large factories have been built and are about completed, and will employ a large number of skilled and unskilled laborers. Shipments have been very much delayed, which has caused loss of trade. Our stock is full, as we make it a point to keep full stock in the dull season.

From Merchants in Florida:

Business with us has been greatly in excess of corresponding period of last year, owing principally to the fact that there has been unusual activity in the phosphate business. There is every indication of good business, farmers will have money as soon as cotton is disposed of. Labor is fully employed, in fact, more work than men, and people are going to the Carolinas in search of men. Collections have not been up to standard at this season, this owing to failure to sell stored cotton. We think that as soon as this is realized on that merchants will catch up with their payments. We are closing the most satisfactory year since our organization.

Trade has been a little better than 1901, owing to local conditions. The orange growing industry has revived a little, and the acreage in truck farms has been greatly increased. Stocks are a little light at this season. Collections fair. The people are fairly prosperous, and labor is fully employed. There are no idle men in this section. The financial condition of farmers is good. Building is dull, and no new enterprises are heard of. The late spring usually brings new developments, and it is the time when investments are made.

From Merchants in Georgia:

Indications for 1903 are better than for past year. Prosperity of people is slowly advancing. The financial condition of farmers is not as good as last year, though the actual valuation of property is no less. Building is proceeding fairly well. Stocks with us are getting heavier each year, as more of a variety must be carried to hold customers. Collections are worse than for years.

The people are generally prosperous, as labor is employed. Farmers are also in a fair financial condition. We are in the midst of a building boom which includes dams, factories, stores and improvements in general.

A large majority of the merchants and farmers are in excellent financial condition. Labor is well employed and farm labor scarce. Skilled labor is fairly well employed on general work, but there is no great amount of structural work in progress. Indications are very favorable for a good business in the first half of 1903. Nearly all merchants are looking for lower prices on some lines, but cannot afford to let stocks run down while the excellent demand continues.

Business has been good during 1902, and the prospect for next year is favorable.

From Merchants in Illinois:

People never were as prosperous before, as every body that wants work has it. The financial condition of farmers never was so good as now. We should judge that three-quarters of the farmers in this county own their own farms and have money at interest. They want

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the best there is and have the cash to pay for it. There has been, and are still coming, new industries, and we never had more building. However, we expect to see this curtailed somewhat in 1903, owing to high prices and labor troubles. We think we are on the top of the wave of prosperity and are now commencing to reduce stock, &c.

The corn crop is the great crop with us, and this year's crop is the largest since 1879, and as the price is good the farmers all have money, and when the farmers have money every body has money. Labor of every class has, and is still employed. In fact people are offering $2 a day for common laborers and cannot get them. The prospect for building is good. All of the architects are full of work to be commenced in the spring, and business for 1903 ought to be a ringer. Our stock at present is very heavy, owing to the fact that we placed orders early and factories were so slow in filling that we had to pick up goods from jobbers as best we could, and after the rush was over factories commenced shipping our orders.

Prospects for next year are very good. Would be better if material were not so high. While nearly everybody is at work, the cost of living is so great that it keeps most people busy to make both ends meet, which prevents them buying as freely of general goods as they would were the conditions different. Stocks are low and have been so all the season. Factories have been slow in making deliveries. On the whole, I believe 1903 will be a good year, probably lower prices will prevail, for on some lines of goods they are high.

Never has there been such prosperity among the plain people. Labor is entirely employed at the largest wages ever paid. Farmers are in good financial condition, and are paying cash, a great quantity of it going to the catalogue houses in the cities. Building prospects for 1903 are good; in fact, we expect a repetition of this year, which has been the largest in our history.

For 1903 general conditions would seem to point to a continuance of prosperity and good business, with this trade as with all others. The people at large seem to be very prosperous, and the majority are well employed, so well employed, in fact, that it becomes difficult to secure extra help, if needed for a short time only. The farmers of this locality, who a few years ago were all heavy borrowers, and who purchased their merchandise "on time," now are paying cash upon delivery, and most of them have good bank accounts. They are receiving the very best of prices for their products in the market, so that in all there seems to be every indication of a healthy condition of affairs. Building for the last half of the year has been far in excess of that of other years, though this building has been confined more to the wealthy than to those of the laboring class.

The prospects for an enormous trade for the coming year were never better for us here and we believe that this condition is not local, but is a general one. Everybody is employed and all have money. There is a new railroad coming through here and quite a little building in sight, as well as some substantial municipal improvements, so our people are very much gratified at the future prospects. We depend upon agriculture here principally and our farmers are in good circumstances, owing to bountiful crops of all kinds last year. We have had more real estate transfers this present year than during the past two, and land has steadily increased in value. In addition to this our farmers have a very valuable asset in this territory in the shape of coal rights, and capitalists have turned their attention to it, and are acquiring large tracts of these rights at a very satisfactory figure, while the farmer still retains his land intact.

From Merchants in Indiana:

The prosperity of the farmer, merchant, mechanic and manufacturer foreshadows a very large business in 1903. Farmers are buying this fall for spring delivery, anticipating payments by discounting their bills. They are buying freely of Fencing, Implements, &c. Building projects are active, with a probable continuance in this direction. Labor seems to be fully employed at good wages, and skilled labor is scarce.

Mechanics are all busy, factories are employing more help than ever before. The farmers are in good condition, having been blessed with excellent crops, and have money to spend liberally. We have had a busy year in the line of Builders' Hardware, and the outlook for the coming year is promising.

The people are generally prosperous, work being plenty, but wages low. The financial condition of farmers is good. Indications point to more building and starting of new enterprises than during the year past.

The demand as compared with former years is greater, and for better class of goods than ever. The general prosperity of our community has contributed to increase and facilitate sales, and the only hindrance to a record breaking fall business has been the weather. Our stock is rather heavy, but satisfactory in size, with few exceptions, covering lines that we will have to carry to another season. Collections are not what they ought to be, considering conditions. We can only account for this through extravagance of some people who have bought beyond their means, and a mistaken idea by many more that in prosperous times the merchant does not need his money. Labor is fully employed at the best wages in our history. Financial affairs with our farmers are the best they have ever been, and we look for another year of building and improvements on the farm, the past year having been remarkable in this respect. While we think the outlook is good, we are gradually trimming down and preparing to meet less satisfactory conditions, that may arise from several conditions that may come about before another year—namely, over production of manufactured products, adverse crop conditions or political changes. We have seen good times come

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Nineteen hundred and two has been a good year. Farm products have commanded high prices and the products have been abundant. Labor has been in strong demand and at good wages. To us the outlook for 1903 is good. Local improvements are expressed by street railway extensions, new mills and extensive building. All of these items are larger than heretofore, and if labor does not demand unreasonable wages these improvements will not be checked.

From Merchants in Indian Territory:

We anticipate an unsatisfactory business next year as we look for harder times or at least a slowing up in the business prosperity. It is ten years since we had a serious money stringency, and an era of low prices and hard times seems to be due. There has been much speculating and watering of stock, and the day of reckoning must be near at hand. However, we hope that our people will see the coming events casting their shadow before in time to prepare and avoid serious disaster.

From Merchants in Iowa:

We had a very satisfactory business in 1902. Indications for business 1903 look very favorable, and there is no reason why we should not have good business the coming year. The financial condition of the farmer is good, his crops were good and he is getting a good price for his produce. Common labor is fairly well employed, and skilled labor is scarce, in fact, more so then it has been for the last ten years. A good skilled workman can get good wages. The building outlook is very bright, and from all indications we will have a satisfactory business year in 1903.

The trade in Northwestern Iowa for the last half of this year has been less than last year. Owing to the "wet season," which lasted late into the fall, crops are not very good and farmers are very much discouraged. Dealers in small towns complain a great deal both about trade and collections. Banks are not loaning any money, and with collections coming in slowly the prospect does not look very flattering. The outlook for next year is, therefore, not as good as a year ago. Stocks are well filled. We are hoping that after January 1 the money market will ease up, which, we think, would help us out very materially.

We do not look for any improvements in the retail business until things adjust themselves. Labor is well employed. Farmers are in good financial condition. Little or no building has been done in this vicinity in the past year on account of high prices of Builders' Hardware.

Farmers are well to do, but will not have the money they have had the last year or two. Banks are loaned up. Do not look for as good condition next year as during 1902.

From Merchants in Kansas:

Conditions are generally encouraging, but skilled labor is now so high and much of the material used in building is so much higher than it was that building enterprises may be curtailed next season. Some people think it a good time to draw in a little and prepare for other conditions which may arise. I think, perhaps, we are going a little too fast, and that prices for labor and goods may get so high as to produce a reaction that might go too far for the good of trade.

Stocks are fairly kept up. Not quite as heavy as during a season of heavy buying, but are ample for all demands. People are generally prosperous. All farm lands are advancing, and prices are decidedly upward. Practically every one has employment. Farmers generally out of debt, except some small debts of the last season. Nothing specially new in way of buildings is contemplated. Much depends on the coming crops of 1903. Wheat prospects are very good.

From Merchants in Kentucky:

So far we do not see any special reason for expecting more than the ordinary amount of business during 1903. Steady employment is slacking off somewhat, but that is generally the case during the month of December, so we need not grow despondent on that account. Building going on at the present time does not amount to much.

We see no reason why business during 1903 should not be good. Collections are excellent.

From Merchants in Louisiana:

We have found the demand for goods rather heavy in 1902. Crops have been fairly good, and the people fairly prosperous. We have had some trouble in getting deliveries, due to lack of railroad facilities, and the fact that none of the factories seem to make any goods up before they are sold. We do not think the stocks through the country are very heavy, everybody being afraid of a slump in the market; in other words, merchants do not believe that prices are based on the real value of goods, cost of production, &c. Therefore, we buy as light as possible, having no confidence in the market. Our collections have been rather good, and we see no reason why 1903 should not be a good year. There is plenty of work for all who want to work. While the farmers in this section have very few bank accounts, we think there is less debt than usual. There are a good many buildings and new enterprises being started in this section. Everything seems to be healthy as far as our local conditions are concerned.

From Merchants in Maine:

The people in this vicinity are fairly prosperous, the farmers above the average, owing to good crops and fair prices. Financial prospects are good. The coal famine affects the local trade and business, but not the country trade, as wood is almost universally used in the country towns. New building, new industries indicate a prosperous year for the coming 1903.

People are just about holding their own, fully employed in all branches and paying more than they can afford to. The financial condition of farmers, as a rule, is good, but owing to the high cost of labor and the low price of potatoes their incomes are cut short this year. Everybody is building or repairing, which stimulates the building material line. Stocks, as a rule, throughout the country are heavy, in fact, country stores are overstocked. Very few new enterprises going up in this section.

From Merchants in Maryland:

The coal strike has been a hindrance in some lines of Hardware. The extreme high price for coal has affected the small repairs with poor people. Our stocks are heavy, more than so than usual. Collections are fairly good. Everything points to a prosperous spring business. Farmers are, as a rule, in fair circumstances, and the people generally are prosperous. Labor is fully employed. New enterprises being started will be a great help to this section. Resident building is about as usual, no boom.

The marked inability to get goods ordered has been the only hindrance to business, hence stocks are light. Collections commence with us on January 1, 1903. Passing the question of coal, our people are fairly prosperous and contented. No man was without work the past year who wanted it. Farmers generally are in good financial condition, more building, especially expensive improvements, than was ever known in same space of time. Everything rushed until bad weather about December 1 shut down business. Prospects are good for next spring.

The development of old enterprises and the starting of new ones has been a feature of the last six months. Demand for goods has been greater than manufacturers could supply or the railroads could transport. The outlook is encouraging, and labor is universally employed. The financial condition of farmers is the best we have ever known. A number of new buildings are in course of construction, and new enterprises are being started that will reach far into 1903. Our contractors say they have contracts unfinished that will take until next June to complete. The spirit of enterprise and development is still the order of the times, which, we think, will extend into 1904.

From Merchants in Massachusetts:

People are generally prosperous in this locality. Labor never was so well employed as at present. Farmers are doing fairly well, but not as well as for the past few years, but their finances are in a fair condition. Building and new enterprises are above the average.

People are well employed, but they save but little, if any, more than several years ago, owing to increased living expenses. The coal situation is a discouraging feature at the moment. Farmers had fair crops, but their balance sheets will not show a satisfactory increase for their year's work, owing to conditions indicated above. For building and new enterprises prospects are very slight.

We note a steady increase in volume of sales, and for last half of 1902 progressing in regular steps from July when sales were smallest to November when they were largest. Do not think we can keep the pace through the storms of December and January, and the short days of February will surely break the sequence. Labor has been fully employed and at good wages, and notwithstanding that living expenses are greater, the deposits in our savings banks have increased nearly $350,000 within the year. Building operations still continue

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quiet, owing to high cost of material and labor, and a return of 3 to 4 per cent. is all that can be obtained from the most desirable tenement property. Manufacturing industries continue active, and with fair prospects of busy times through 1903, the impression being that the present impetus will carry along to or through the summer. Farmers have no crops of corn or potatoes, but those with wood are getting a revenue, which will compensate for loss of crops. Collections have been slow.

From Merchants in Michigan:

We expect a fair business, but should drawbacks set in such as strikes, unfavorable weather, limited crops, extreme high prices for building material, &c., trade would suffer. In some of the farming sections very little building will be done, owing to light crops. City labor has no reason to complain, as it is fairly well employed. The shortage and high prices of building material has retarded building operations.

Labor is more generally employed than for many years and at better wages, which is a fair indication of good business ahead. Farmers are in an excellent condition to pay their debts and to improve and add to their farms. The high price of lumber is restricting many building enterprises, but improvements in the way of fencing will be greater than ever, owing to the recent decline in the price of Woven Fence and Wire.

Demand for the past six months has been less than former years, as no new improvements are being made and fewer laborers being employed. Stocks about average. Collections poor. The outlook in this vicinity does not appear to be any more encouraging than last year. An advance in price of copper would help us out. Unless the copper market improves we do not think there will be much in way of building done.

Trade for the year has been heavier than in 1902, better crops, more building, more manufacturing. Collections are good. Every body is prosperous, every man is employed, and the condition of farmers first-rate. Many new enterprises are talked of. Christmas trade was slow, on account of mild rainy weather.

From Merchants in Minnesota:

A wet season and damaged crops tended to dampen the ardor of the farmers and trade the last half of the year was not as good as the first half promised to be. The cool weather that was so characteristic of the season just past made the sale of Bicycles, Gasoline Stoves, Freezers and Refrigerators almost an impossibility. As a result of the cool wet summer heavy stocks are carried over by the dealers. Collections never were as poor as they have been this fall, this is because the farmers could not find enough dry days to thresh in. We do not look for a very large business the coming year and believe that the merchant who uses the utmost conservatism in his buying will be patting himself on the back in the fall of 1903. The excessive price of lumber and the frequency of labor strikes causes builders to think twice before starting a structure. The strike among the hard coal miners has left an immense stock of hard coal Stoves on the hands of the dealers.

Farmers are from four to six weeks behind on account of wet weather, and the high price of help, together with the scarcity of it. Stocks rather light. Collections rather backward, but quite certain. Demand less than last year, but above an average. Farmers prevented from making some improvements on account of wet season, and being behind in their work. Town people are fairly prosperous, farmers exceedingly so, and labor is well employed. If snow continues January and February will be much better months than past two years, when ground was bare. Not much town building in sight, but some new factories possible. The great danger of loss to the retailer is his inability to force off the general run of his stock when entering a period of declining prices. He must in many lines await the customer. A wise handling of the "combination" problem will lessen this evil of "declining years." If reci-

Trade during the last half of 1902, as compared with other years, has fallen off quite perceptibly, owing to a crop that was far from being up to average, especially in net profit to the farmer. Prospects for fall trade had been, up to the middle of summer, unusually favorable and merchants had pretty generally anticipated a good trade during the fall months. They had consequently bought liberally and, therefore, stocks at the present time may be said to be rather heavy. Collections have been decidedly slow, although a general improvement in this feature is being noticed now. It is rather early to speak of the indications for business in 1903. People are fairly prosperous, although perhaps inclined to be a little close until they can know more as to the prospects for a crop next year. Merchants are certainly inclined to take a hopeful view of the situation.

Our farmers had good crops and are getting very good prices for their products. All mechanics and laborers have been continuously employed at good wages. Stocks are running lighter than usual, and we are placing orders only for such goods for future use on which prices are absolutely guaranteed, as we believe the top notch on prices has been reached. Collections are good. We look for continued good business for the first half of the coming year at least. Especially will this be true as to building material and Woven Wire Fencing. The financial condition of farmers never was better. The only thing we fear is that overcapitalized trusts will not be able to keep up their fixed charges and may demoralize things.

The biggest volume of business we have ever enjoyed has been during the past six months. A great many new buildings have been put up here, which increased trade. Our stock is the heaviest it has been for some seasons. Collections are rather poor, owing to the lateness of the season. The prosperity of the people is generally good. Labor is fully employed, and the financial condition is fair. We are looking for a repetition of 1902 for next year, nothing better.

From Merchants in Missouri:

Stocks are well filled. Collections fair. Furnace business has been exceptionally good, owing to coal strike, Stove trade also has been quite satisfactory. All classes are now well employed. Farmers have had good crops, which are selling at high prices, and both conditions point to much building for new year, provided that the inflation carried to such extremes by the financier does not cause a stringency in the money market and destroy all our racy prospects. If we had less speculation there never would be any danger.

From Merchants in Montana:

The result of our observation is that the coming year in our section will show business to be quite as good as it has been during 1902. If there is any indication of an interruption of the present activity we are at this time unable to discover it.

The past year has been very satisfactory, as there has been a good market at fair prices for everything that the producer produced in this country. As to what the outlook is for the coming year, it is a difficult matter for us to determine at this time, although we can say that at the present time the outlook is as good as any year at this time.

From Merchants in Nebraska:

Indications point to a prosperous year, as laborers are busy at the highest wages known for 35 years. Farmers are in good financial condition; many of them are purchasing modern conveniences for their homes. Architects are busy planning new buildings. There is a gen-

eral feeling of cautiousness and no desire is shown to boom or speculate.

Business for last half of 1902 has been good, owing to building among the farmers, who, we can say, are all prosperous. Good crops and good prices for them. The catalogue houses are cutting a figure, as we see goods every day at depots for the farmers from them. Dealers are carrying good stocks. Collections fairly good. Ours is a farming community, and farmers are all doing well, putting money in the banks. They are buying better class of goods to-day than ever before. Prospects for next year are good. Profits are better than heretofore, because price cutting is stopped. Of course, we have the racket and department stores to contend with.

From Merchants in New Hampshire:

No new buildings or new enterprises are in prospect for 1903. Labor, however, is well employed, and heavy teams, ordinarily idle, are this winter hauling wood. Farmers have experienced a good season, had plenty of snow in December and have done well financially.

General trade has been good. There have been no especial influences affecting business during 1902. Stocks of goods are about medium. People are prosperous, and the financial condition of farmers is good. Labor is scarce and well employed. There is a medium amount of building in prospect, while the outlook for business for the coming year is encouraging.

From Merchants in New Jersey:

Farmers in this section are generally in better shape this year than last, having had fairly good crops and remunerative prices. Mechanics are not generally employed on account of little building activity right in this immediate locality. The outlook for 1903, I should say, was good. The crying business evil is credit, in my estimation no retail business should ever be done except for cash, and it seems to me that some merchants will have to come to this or quit. The advantage the average customer takes of the man who is willing to trust him is outrageous, and yet the Hardware business is of such a nature that it is the most difficult one to conduct on a cash basis, unless some lines are eliminated, and repair work is almost or entirely thrown out. A Hardware organization in this State that would have for its prime object the bringing of this business down to an absolute cash condition would be a boon to the average dealer.

There is no need of any one who wants work being idle. Building operations are confined almost entirely to factories and additions to the same. The prosperity of the people is greater than ever in the history of the country.

We hear more complaint in regard to the labor question than any one thing. It is very hard to get help, every man who wants work can get it. The trouble is that men cannot be found. Lots of farmers are behind with their work on this account. There have been fewer mortgages on farms foreclosed this year, in this section, than in many years, showing a better state of affairs. The farmers are keeping their buildings in better shape, painting, repairing, &c., a number had to enlarge to care for their crops. A drive through the country will show a condition of prosperity, as the fences and buildings are in good repair.

The demand for goods has compared favorably with former years. Condition of the season has been the natural cause of demand, rather than progress on the idea of prosperity. Reorganization of industrials has caused suspicion to some extent causing a personal interest among ordinary public to hold money rather than invest, consequently money seems to be easy among the masses. Collections are fairly good. Hindrance to trade follows on the line that labor is taking advantage of every avenue in its power, by organizing every trivial branch of trade, even to barber shops and peanut stands. Stock in store in all general lines is average full, no shortage, no surplus. We believe the people in general have been economical this year, and have means to tide over a short period of depression. Labor is mostly all employed in this vicinity. All manufacturers are running. No great indication of building or extensions. All tradesmen should buy as needs require to keep stocks full and not look toward speculation. Material values, and labor with its short hours, are inflated to the highest tension.

From Merchants in New Mexico:

Indications for next year are even better than they have been this prosperous year. The amount of goods in the small country shores, especially those off from the railroad, would surprise even a city salesman. We know of a small store so full of merchandise of every description, having only 6 feet of standing room for customers, that sold $30,000 this year. Another one somewhat larger sold $115,000. These are not fairy tales, but actual facts. The railroad fever is raging in New Mexico, and we will soon be covered in every direction, developing our mines all over the territory.

The outlook for the coming year is very bright, and our people all seem to be prosperous and making arrangements for building and other improvements for the coming season. Wool and other products raised in this country are bringing excellent prices, and, taken in connection with the new railroads that are being built, all have plenty of work and money is easy. Our people here are all almost self sustaining, and the depressions and panics in the East have little effect upon us.

From Merchants in New York:

At present our labor is universally well employed, there being no difficulty for willing workers to find employment. This applies to our own city as well as the nearby towns, including the farming community. Farmers complain that it is almost an impossibility to obtain sufficient labor to carry on their business. The manufacturing industries in this city are increasing their plants, and unless we have serious labor troubles, business for 1903 will be on a par with the year previous. I believe, however, that building will not aggregate that done in 1902. Farmers are in a prosperous condition. They report on the whole a good average of crops, and all farmers' produce in this market is bringing satisfactory prices. I look forward to an increased business from this source.

Collections are poor, while newspapers are trying to whistle as they pass through the graveyard and claim prosperous times ahead. Still there is no disguising the fact that trade is slow and very unsatisfactory and the outlook unfavorable. No new enterprises to any amount in view. Some manufacturers are retrenching by letting some of their help go. Farmers as a rule are in bad shape and unwilling to purchase beyond actual necessities. The outlook for the coming season is anything but good.

This county being chiefly a dairy section, milk and cheese have commanded a good price and our farmers have been prosperous. Labor has been well employed, but the desire of laborers to seek employment in cities and villages, and their aversion to farm labor, has and continues to be a serious embarrassment to the farmer. Building and new enterprises have in our city been quite moderate.

Prosperity reigns and everybody has work, unless he is unwilling to do it. The farmers as a rule are in much better financial condition than a year ago. There is no new building to any extent and no new enterprises. We look for a better trade next year, as all conditions are constantly improving.

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If farmers have good crops in 1903 we will be content. Every one is employed, and the financial condition of the farmers is fair. Many new residences are in contemplation.

From Merchants in North Carolina:

The people appear to be prosperous, as they are placing their money in the banks, or investing it in enterprises which we are glad to note are being diversified. Every man, whether skilled or unskilled, can find employment. The financial condition of farmers is better than it has been for several years. We have an abiding faith that business will be good during 1903; that it will be remunerative alike to the farmer, merchant, artisan and mechanic.

From Merchants in Ohio:

Business for the last half of 1902 has shown a good healthy increase over any previous year. The only serious drawback to the year has been the slow deliveries from both manufacturer and transportation companies, which has compelled the carrying of larger stocks than usual. But prompt remittances have made the load easy to carry. Prospects for business in 1903 are bright. Unemployed labor is scarce. Farmers as a rule are prosperous and are improving their farms freely. It is early to anticipate the amount of building, but if the unexpected does not happen, it will fully equal 1902, which has proven a satisfactory standard.

The demand for goods throughout the past year has been very satisfactory, although the scarcity of hard coal has interfered materially with the sale of hard coal Base Burners. I am carrying about the usual amount of stock, for I have always found it a good plan to keep up a fair assortment, no matter what the prices may be. Collections are very good. Our factories have plenty of work and there have been sufficient improvements in process to give work to the common people. Farmers have been able to get a good price for everything that they have had to sell, and their purchases have been larger than heretofore. While there has been quite a little building and some new enterprises, still in this feature caution has been exercised and there are many enterprises and buildings in prospect which depend somewhat upon the future.

Demand has been about the same as in 1901, but better goods wanted in some lines. Unseasonable weather has hurt sales of seasonable goods in several lines. We believe stocks are inclined to be heavy. Collections have been good throughout the year. Prospects good for business in 1903. People have money and are willing to spend it. All have employment who want it.

Demand has been better than usual as the result of building and the starting of new factories. The difficulty of getting orders filled and the inability of railroads to make prompt shipments have been drawbacks during the past six months. The people are prosperous and very few laborers are unemployed. The financial condition of farmers is good and prospects for 1903 are bright.

Trade during the last half of 1902 has been not so good as for 1901. We expect a good year in 1903, but that depends entirely upon local conditions. In small towns like this the local conditions have more to do with business than anything else.

From Merchants in Oklahoma:

We see no reason why business should not be better than last year.

From Merchants in Oregon:

We are pleased to state the outlook for business is excellent for next year.

The general prospects for business next year are very fine indeed and we expect this prosperity not to be confined to the Hardware line, but to extend to all classes of trade. We had a large hop crop and growers received a big price for their crop. Wheat did not make a full crop and the price was only fair. There was a large amount of building done in our city and county this year, and next year promises even greater activity along that line. The lumber business is on the boom and the output next year will far exceed any previous year. We will also have great activity in both the Blue River and Bohemia mining camps. Everything here looks good for a big year for 1903.

We are unable at this time to see anything to interrupt the prosperity in our section for the coming year.

From Merchants in Pennsylvania:

Everybody working and at good wages, and the man who is idle is so because he prefers to be. Don't know much about farmers, but think they are in better shape than they will acknowledge. No let up in building operations and prospects quite as good and perhaps better than one year ago. Congestion of the railroads and their inability to handle the volume of business offered has been unfortunate. Expect to see Wire Nails, Wire and kindred products advance in price, since the United States Steel Corporation have acquired control of their principal competitors.

Opening of the new mines and the remarkable development of those already in operation has necessitated much material in the Hardware line. We have been very much hampered by inability to get goods promptly, due to the failure of the factories to supply promptly, also to the inability of the transportation companies to make prompt deliveries. We find stocks generally are heavy but active. Collections are good. The prospects for business in 1903 are bright. The miners are enjoying plenty of work and good wages, while the farmers have good crops and better prices than for years. Labor is fully employed and prospects of an active building season are fair.

Our mills are booming this section by putting considerable money in circulation, thereby making collections better. The indications for business in 1903 are very bright. There is lots of work; too much for the number of men and houses. Farmers have a good market for produce.

The demand for the last half of 1902 was for general line of better goods in Tools and House Furnishing Goods. Our stock is large. The general public are buying freely on account of the general employment of all labor, especially that employed by the manufacturers. The building prospects are not over bright, owing to the increased cost of all kinds of material. We are glad to see the changes in prices on staple goods that have been made. They are moving more freely and it is less trouble to sell goods than at the high prices formerly ruling. The dealer is making more profit with less money invested. We are especially glad to see Shovel prices adjusted to arbout the right basis.

Labor is fully employed and people are fairly prosperous. Building is light, but a number of new enterprises have been projected. To strike an average business for the last half of 1902 has been good and the outlook for the future is encouraging.

From Merchants in Rhode Island:

We have no complaint to make, as business has been very good, and we are carrying a full stock of goods. Prospect is good for a prosperous year. Manufacturers are far behind on orders in about every line, which indicates an active market for goods.

Demand has been steady, but calls for goods have been in small lots. The aggregate has been greater than for any year since 1891. High prices of lumber and Hardware together with the strikes of trade unions have shut down on new building to a great extent in this section, our sales for the greater part being for repair work. We note an increase in the sale of cheaper grades of Hardware and a corresponding decrease in the better grades. Our stock is normal, or has been up to within a week or so, when we began buying in some lines for spring trade. Our increase for 1902 over 1901 has been about 10 per cent., 6 per cent. first half and 4 per cent. the last. The people generally are in a prosperous condition. Wages are fair and work is to be had for about all who want it. The farmers have had, generally speaking, good crops, for which fair prices have been got. There is very little talk of building in this section for the spring of 1903. Collections for the year have been fair.

From Merchants in South Carolina:

The demand for goods and other conditions for the last half of 1902 have been excellent. From present indications we consider that the prospects for the coming year are the best that we have had for ten years.

Pretty good trade with a regular demand for goods characterized the last half of 1902. Town people are prosperous, and the farmers are in good financial condition. A number of enterprises are being started. Diversified cotton manufacture is increasing rapidly. Business prospects for 1903 are good.

From Merchants in South Dakota:

Causes affecting trade during the last half of 1902 will extend into next year. Money is tight, and farmers have not had a normal corn crop. Labor is employed, and people feel fairly prosperous. There will be quite a good deal of building in our town.

Trade for the last half of the year has been fair, but very disappointing during the last quarter. We attribute it to the great disappointment in crops, as in this locality everything depends on our crops. One-third of a crop of corn a total loss, all on account of summer frosts. The scarcity of hard coal made Heating Stoves unsalable, and while we managed to work off the most we had on hand, we did it at no profit, as it was simply a question of having the Stoves on hand or their value in money. The light trade has left unusually large stocks on hand for this season of the year. Collections have been poor, and money is scarce. We consider the prospects for 1903 not very good, for reasons stated above; poor crops, which means limited amount of money; the farmers are in very good financial condition, yet have comparatively little ready money except for necessaries, and those who have are keeping pretty close to the shore. We do not anticipate much building.

From Merchants in Tennessee:

The demand has been greater than ever before in this section, owing to the developments in coal and iron, also some timber. Lack of reasonably prompt shipments by manufacturers has been very annoying to jobbers. Our stock is now fairly heavy for spring business, as we begin to ship in January. Collections very fair, but not up to demand for goods. Everything points to a large spring business. Most of our people are in good shape. Lots of building in prospect. Labor never so well employed. Farmers are buying luxuries. Sporting Goods and Vehicles never in such demand. Our city has grown more in the last two years than the ten years previous.

Trade has been a great deal better than for the past two years, owing to the good crops. Farmers will about pay out of debt this year. About all labor is employed, as is shown by the fact that help is hard to get. Considerable building is being done.

High prices of farm products have helped materially, together with much building. Collections are fair, while stocks are about the average for the season. The country is in a prosperous condition. Factories are in limited number, consequently not much labor employed. Building and new enterprises for the coming year will not be up to past. We look for good trade for the year, based on the condition of the farmers, on whom we depend almost entirely for business.

From Merchants in Texas:

Trade in all lines has been very quiet, owing to two short cotton crops succeeding each other. Cattle are not selling, in fact, there has been little or no demand for them. Farmers and stock men are in debt. The banks have about loaned all their money down to the lawful reserve, and are having to renew paper until cattle move. The recent rains within the last three months make our prospects brighter, but will have to make a new crop before any money comes to us. There is a big demand for credit this season, the demand comes earlier this season than usual. Merchants are renewing farmers' paper, will have to carry them over until a new crop is made. Within the last three months our rainfall has been more than our average annual rainfall. We look forward to a good crop this coming season.

The last quarter of 1902 has fallen off from 25 to 40 per cent. Collections slow, many failures, and many of our customers are arranging as best they can to be carried on next year's business until the fall of 1903. Texas crops have generally been poor this season as well as last, and merchants seem determined to reduce their stocks as far as they possibly can. Our people depend almost entirely on agriculture and stock raising. Agriculture is very much depressed; farmers are out of money and will have to be carried by the country merchants. The country merchants have not collected more than 50 per cent. of their outstanding accounts, and are not in position to offer much relief unless they in turn are assisted by the jobber. The Texas jobber will have to sell largely on credit or not at all.

For the last half of 1902 the demand for goods was not as good as last year, as crops in this section of the State were very short. Stocks, as a rule, are heavy, as jobbers bought early in the season expecting fair trade and fearing a delay in prompt shipments, as has been their experience in the last few years. Collections are not good because farmers have been unable to market their crops on account of the condition of the roads. The outlook for business in 1903, from a jobbing standpoint, is not very flattering. The retail trade should be fair, as there is considerable improvement going.

The last half year of 1902 has been the dullest and most unsatisfactory half year that I have ever experienced. Stocks of goods are very low in conformity with the extremely light demand. Collections are poor, and bankruptcies, assignments and fires are too numerous to mention. There are also many good merchants retiring from business. This state of affairs is the result of two successive crop failures in Central Texas. The cotton crop was also short in both seasons on account of drouth, flood and destructive insects. Indications for 1903 are doubtful, as no one can foresee what kind of crop will be produced in Central Texas next year. The chances are very strong that the cotton will be injured again by insects. The production of corn, oats, cattle, &c., may or may not be profitable, but should profitable crops be raised next year all the evil effects of the last two failures would be obliterated, as we have a very fertile and productive soil and climate. Labor is not well employed, and the financial condition of the farmers, on account of the causes above mentioned, is not good. However, there are more buildings and improvements in process of construction than the hard times would seem to justify.

From Merchants in Utah:

The indications for business which now present themselves are such as to incline us to the belief that the

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year 1903 will be fully as satisfactory as the past year has been.

The outlook for business in this State is very good. The mining industry in Utah is quite prosperous and the output of the mines is steadily increasing. The prospect for water supply for irrigation purposes for the coming season is very good, and altogether the indications are favorable for a good business in this State next year.

We see no prospect of serious interruption of the existing prosperity in Utah, and Salt Lake City in particular. The agricultural resources of Utah are steadily growing in importance, and with assistance to be given by the general Government in developing irrigation, the agricultural wealth of this State will be greatly increased. Utah is rich in minerals, and while we deprecate the fall in silver, the increase in the production of gold, copper and lead will make up for it. In Southern Utah there is an unlimited amount of iron ore, with coal in close proximity. Ultimately this great interior region, and possibly the Pacific Coast, will be supplied from that point. There are two or more new railroads headed toward Salt Lake City, which, in addition to those already in operation, will make it a great railroad center and add to its population and importance. It has a large wholesale trade now, and it will be increased with better railroad facilities. We look forward to the new year with hopeful anticipation.

From Merchants in Vermont:

The general features of trade during the last half of 1902 have been satisfactory. Prospects for business next year are excellent, and if prices are not too high 1903 will eclipse all previous years.

Stocks are fairly well assorted, but we have been bothered to get goods in some lines. Collections are very good and people spend their money quite freely. The people hereabouts are prosperous and labor is fully employed, both mechanics and day laborers, and all at good wages. The farmers are prosperous, getting good prices for whatever they have to sell. The shortage of coal has helped them very much, for it has enabled them to market a lot of wood at rather high prices, quality considered. There is a fair amount of building in sight, more than for several years past.

General trade has exceeded that of 1901. The products of our section—viz., slate and dairy—have been in large demand at good prices. Stocks are being well kept up to meet the steady demand for goods. Collections at present are only fair. The catalogue houses are still at large, but we are happy to say that a large percentage of the people are not patronizing them. The laboring man has no trouble in securing work at good wages. The farmers are obtaining good prices for all their products. An average amount of building has been done. There are no new enterprises of especial note. The outlook for 1903 is certainly bright. We are pleased to note the general steady market that has, with few exceptions, prevailed in the Hardware line for the year, and we feel that when the annual inventory is taken it will show a very favorable balance.

From Merchants in Virginia:

The indications are for a steady demand for good goods and a willingness to pay fair prices for them. Collections have been very good, but owing to a poor season for the staple farm products we may expect a falling off for the next few months, although we have never looked forward with brighter prospects for business than we do to 1903. A great hindrance to profit in this section is that Nails, Fence Wire, Loaded Shells and some other staple articles are sold with comparatively small profit.

Trade is better than ever before, but collections are rather slow, as usual at this season, people waiting for the yearly settlement on January 1. We look forward to a good trade in 1903, though do not expect it to be as large as during the past year, as crops were not heavy and the coal trouble in West Virginia interfered with business.

Trade for the last half of 1902 has been unusually good in this section. Quite a good deal of building has been done. The most serious drawback to business is the delay in filling orders at the factories and the long delays occasioned by the railroads in forwarding goods to destination. We look forward to the year 1903 as one of great activity and solid material prosperity. The prospect for a wheat crop was never better. At present the indications are that more than the usual amount of building will be done.

We attribute the excellent demand for Builders' Hardware, which we carry exclusively, somewhat to the fact that our city has been doing a great deal of building, owing partly to large fires in the business district and to the general development of the city. Country orders have been better. The greatest difficulty with which we have had to contend has been the long delay in the filling of Hardware orders. This has affected business quite seriously. In some instances we have been obliged to keep our customers waiting for five or six months for special Hardware, which should have been furnished in six weeks. Stocks now in the hands of the large dealers in this city are heavier than usual, owing to the fact that we have all had to stock up heavily in order to have the goods we needed. Collections have been considerably better this year than last, and we shall have to charge to our profit and loss account a very much smaller amount than heretofore for bad debts. Local indications for business in 1903 are very flattering. Our laboring classes seem to be very generally employed and at good wages, no men being out of employment who are willing to work. The condition of the farmers is good. There promises to be more building here than during 1902.

From Merchants in Washington:

Everything looks favorable in this section for continued prosperity. With us, we depend almost entirely upon the Eastern lumber trade, and our prosperity depends upon demand and prices on our product in the Eastern markets.

So far as we can see there is no reason why we should not have another prosperous year. We have had a greater amount of moisture than ever before at this season. Many newcomers are arriving, and land is continually advancing in price.

The prospects for business for next year were never better. Our city is very prosperous; building, both in business blocks and homes, is going ahead as never before, and architects are very busy in drawing plans for next season. Even at this season of the year the demand for labor is equal to the supply.

Since the expenditure of a great amount of money for irrigation, the development of this portion of the State of Washington has been very rapid. When the ditches under process of construction are completed there will be in the neighborhood of 20,000 acres of irrigated land in the Wenatchee Valley, which means that it can easily support a population of 40,000. This increase in population means an immediate growing demand for all kinds of Hardware, Building Materials, Farm Implements and Machinery; a demand which is ably met by the different Hardware stores in this section. The two principal towns in which the business of the valley is carried on can boast of three Hardware stores which would be a credit to any city. They are undoubtedly in advance of the country, setting a standard of excellence for other business houses, anticipating the needs of newcomers. The stock is adequate for an immense business, and the development of a new country will not be retarded by any lack of Hardware facilities. The Hard-

ware business is dependent not alone upon the farming community for its success, but every enterprise that aids in the development of the valley increases the demand.

From Merchants in West Virginia:

Railroad building in this section has had a beneficial effect upon business. Stocks are light and collecti ns only fair. Future prospects are go d, all labor being employed. The financial condition of farmers is only fair. The outlook for building and the starting of new enterprises is better than in 1902.

The volume of business for last half of 1902 has been somewhat in excess of previous years in dollars and cents, owing to the general high prices, but the percentage of profit will fall below the average. Stocks seem to be about as usual at this season, but collections might be termed bad. We can hardly say, with any degree of certainty, what the prospects for 1903 are, but our people are fairly prosperous, labor very well employed and farmers in a fair financial condition. There is some building talked of, but no new enterprises in sight.

The demand has been better than during the first half of 1902. The coal strike has been the great hindrance to trade. Stocks run light, as we have indications of a weaker market on heavy goods. Collections are not up to the average, especially in retail department, and collections in jobbing department are not satisfactory. Prosperity of our people seems assured. New developments in coal and branch railroads are contemplated. Labor is well employed. The financial condition of the farmers is not up to average, as crops have been very light, not much surplus grain. Collections from farmers very dull.

We are trying to reduce our stock in Stoves and kindred articles, because we have no faith in the advanced prices being permanent. We are trying to hold our stock as low as possible on Tinware and Sheet Iron Goods, expecting further declines. We are loading up on Nails and Wire, thinking the purchase of the Union Steel Company interests will cause a raise in these goods. Collections are not as good as last year. It requires a greater effort to keep them up. The fluctuations of the markets have to some extent hindered trade, but not to the extent we anticipated. Our people are prosperous and happy. Labor is generally employed. Farmers are prosperous, because of rentals for Oil purposes, and because they are selling their coal to large buyers of this product. There is considerable building being done, but not as much as last year. More new enterprises are coming than ever before, because of abundance of coal and natural gas in West Virginia.

From Merchants in Wisconsin:

Trade has been very encouraging, better than former years, due to the very excellent condition of the crops and the high prices received; the price of lumber being higher than ever before known has added materially to the good times. There is less request for credit, hence the collections are lighter. The outlook for the coming year is correspondingly good, with every indication that it will be equally as good if not better. There have been more farmers paying off their mortgages than ever known in this section of the State. And as they get out of debt new buildings will be the next move. While not an advocate of trusts, yet we believe that many ills can be cured by them which no other agency can bring about, thereby benefiting the retail Hardware trade. There could be a great deal more good done if a closer relationship existed between the trusts and our National Retail Hardware Association. The retailers are the men behind the guns, not the jobbers.

Business as a whole this year has been exceptionally good with us, our sales running from 15 to 20 per cent. ahead of last year. People are buying more freely than at any time since 1891. There has been a greater amount of improvements in city and country than ever before, showing prosperity everywhere. All classes of mechanics have been very busy. In our own business it has been a source of annoyance to us to be obliged to turn away a great deal of tin and sheet iron work, on account of our inability to secure sufficient help. Our farmers seem even more prosperous than our city people and buy more freely than formerly, buying a better class of goods, and have the ready cash to pay for them.

Conditions in every particular are about ideal. Crops have been excellent, and so have prices. Collections are good. The indications for business in 1903 are very promising. There is more money in hands of farmers than ever before, and every man that can work is busy. There is much new building being done.

Business in the last half of 1902 has been satisfactory in Wisconsin, fully up to, if not surpassing, other years. Stocks are large. Collections good. Prospects for 1903 are bright. All classes of people, especially farmers, are in good shape to buy what they will need.

The season with us has been very satisfact ry, and collections are fair. Stocks are not heavy, but are in good shape. The outlook for business in 1903 is very favorable. People are prosperous, and wages in the woods were never so high as this season. Farmers are receiving very good prices for everything they have to sell. There will be considerable building during 1903.

Correspondence.

A COMMISSION TO REPRESENT THE JOBBING TRADE.

To the Editor: By reason of the formation of the various combinations and the existing price agreements between manufacturers, the Hardware jobber is at the present time confronted with a new peril or problem which is serious and demands speedy solution. The new condition referred to as confronting the Hardware j bber is the present policy of manufacturers to either combine or agree on selling prices for their products, and offer the jobber a differential or protecting profit, which invariably is less than the average cost of doing business.

Few of us realize how many classes of goods are now on this basis, and the list grows almost daily. It is not necessary, nor would it be proper here, to point out the list, but it is larger than we realize at first consideration. Owing to the constantly increasing number of articles having a selling price, and a small salary or protecting profit reserved for the jobber, it is estimated that this class of articles or commodities now equals 30 per cent. of the average jobber's entire sales. If 30 per cent. of the total business done is of this class and is sold without a profit over and above the expense of doing business, the conclusion is readily arrived at that it will soon be impossible for the jobber to show a profit, or, if one, a very meagre one. With almost no exceptions the manufacturers have shown that they are willing to meet the jobber half way and allow him to act as a distributor; also that he should have a proper protecting profit; but because the jobber has not been in position to reserve such a profit the manufacturers have not made the same sufficient to leave a margin over and above the cost of doing business.

OUR PLAN FOR MEETING

the above difficulty and enabling the jobber to join the manufacturer in securing and maintaining a reasonable profit is simply to follow the plan now very generally adopted by manufacturers who are not united in a trust, but who have a price agreement, and appoint two commissioners for the jobbers of the entire United States, these commissioners to have a central office in New York City, as most manufacturers' conferences are held in that city. It shall be their duty to confer with manufacturers on the existing schedules of differentials; also to arrange for the same on lines not now sold in this

manner; to endeavor to establish closer relations between the jobbers and manufacturers; to confer, consult, and keep the trade fully advised regarding all arrangements, and at all times to exert every effort and influence for the benefit of the jobber in his present position.

We believe the time is auspicious for this movement, as a great many manufacturers are at present inclined to move in this direction, and the jobbers and trade in general have felt the necessity of concerted action, as evidenced by the rapid extension of association work throughout the United States. The positions of these commissioners would be greatly strengthened in their efforts by having the aid and influence of the secretaries of the various associations working in unison. Much of the association work fails to accomplish the results desired because the associations are not truly national in their scope and have no means of enforcing obedience to agreements, or to schedules, as arranged.

The plan for holding the jobber to securing and maintaining the differentials allowed by the manufacturer is again to follow the successful plan of the manufacturers and make the differential on a class of goods the forfeit. If the jobber were found to be deviating in any way from the selling price as established by the manufacturer, his name, upon proper proof by the commissioner, would be dropped from the list by the manufacturers as one not entitled to the differential on this class of goods.

REQUIREMENTS OF A JOBBER.

In determining as to who is a jobber we would submit the following qualifications:

First.—He must carry a wholesale stock of Hardware.

Second.—He must have at least two traveling salesmen, who travel 12 months of the year.

Third.—He must sell the line to regularly established retailers.

Fourth.—His annual wholesale business must amount to at least $100,000.

It would be readily observed that this plan of having commissioners for the jobbers would not work to the disadvantage of either the large or the small jobber. The benefit to the large jobber would be obvious, while that of the small jobber would not make or break him, and his benefits would simply be in proportion to his efforts. On the contrary, the plan would curb and cure the excessive competition now existing, and which if continued will make the occupation of the Hardware jobber profitless. The manufacturers found that competition was so excessive in many mines that a large number were forced either to suspend operations or adopt the plan referred to, and the Hardware jobber of to-day finds himself in the same condition. By the adoption of the above plan we believe the business will be saved to all and a fair return realized for the capital and labor engaged in the occupation.

ANOTHER IMPORTANT RESULT

would follow in making the jobber more secure in his present position as a distributor. Without a plan of this kind the jobber's position will become more insecure each succeeding year. With a proper differential maintained by both manufacturer and jobber it would be possible for the jobber to meet the prices of the manufacturers. The department and catalogue house competition would also be curbed to a very great extent. Judging from the number of legitimate jobbers throughout the United States, the annual fee, or salary, from each for the expenses of the commission would be comparatively insignificant in proportion to the benefit to be derived. By the united efforts of all jobbers and associations of jobbers working through the same channel, tremendous power and influence could be wielded for the benefit of the jobber.

POSITION OF THE VERY LARGE JOBBERS.

The argument has been advanced that some of the manufacturers, also a few of the largest jobbers, would not consent to a plan of this kind. As for the manufacturers, we find that the shrewdest, largest and most successful ones have seen the wisdom of continuing their interest in their products to the extent of the jobber at least realizing a proper profit. This sentiment is growing, and the additions are constant to this method of marketing the different products. As for the few large jobbers (who might remain out and insist on being free to do as they please), they would place themselves in direct antagonism to all other jobbers, large and small, and it would simply be their capital against the combined capital of all the other jobbers.

On some of the largest lines of goods at the present time the largest jobbers referred to above are compelled to observe the same schedules as all other jobbers, and if the above plan were adopted it would carry them along to a very great extent, even though they opposed it. The only thing left for them would be to engage in the manufacture of a great many lines of goods, and there is no danger of any jobbers, no matter what their size, engaging extensively in the manufacturing business in addition to the jobbing business.

Inasmuch as the above plan effects only the lines in which there has been practically no profit, it is very evident that no harm and only good could come from its adoption.

RETAIL REPRESENTATION AT THE JOBBERS' CONVENTIONS.

From a gentleman actively identified with retail Hardware organization in the West we have the following letter in which he refers with approval to the suggestions made in our columns a few weeks ago, in regard to the desirability of having the Retail Hardware Associations represented at the great conventions in which the jobbers and manufacturers meet together:

If such a meeting could be brought about as the one you have outlined I cannot help but feel that there would be a great deal of good derived from it. There is no question in my mind but that better conditions can be obtained where associations have closer relationship and a better acquaintance between parties representing them.

From the meetings that have been held between manufacturers and jobbers they find that there have been good results. I certainly cannot see why when there are any questions that they are interested in mutually with the retailers they could not be better handled and a better knowledge secured if the retailers were represented in their conferences. The National Retail Dealers' Association have felt that they were closer and understood better the jobbers' position since they met with them in conference about a year ago. I sincerely hope that your idea may be fully realized, and that before many months are past that mutual arrangements can be made where the three organizations will have an opportunity of discussing matters together.

GURNEY REFRIGERATOR COMPANY.

THE GURNEY REFRIGERATOR COMPANY, Fond du Lac, Wis., have issued a set of catalogues for 1903 devoted to their special lines of manufacture. Catalogue No. 1 sets forth the merits of the Imperial Refrigerators, a new line provided with a sliding adjustable shelf. Catalogue No. 7 calls attention to the Cold Wave line, which is provided with a movable, cleanable ice tank. Catalogue No. 8 is devoted to the interest of the La Belle Refrigerators. Catalogue No. 13 sets forth the latest results of the energy of the company under the title of the Gurney Patented Refrigerators. It is here noted that the company are bringing out a new line known as the Common Sense Refrigerator, which is a combination of the Gurney and Imperial styles, and is equipped with sliding adjustable shelves. The new hygienic Gurney Chinaline Refrigerator, the company's finest product, is also shown. The entire interior of this Refrigerator is lined with one piece of china without crack or crevice, according to the catalogue description. The company have recently completed new warehouse No. 2, and as they have been running at full capacity since the close of last season, they assure patrons that orders will receive prompt attention.

BIDDLE HARDWARE COMPANY'S NEW BUILDING.

BIDDLE HARDWARE COMPANY, Philadelphia, Pa., are now comfortably settled in their fine new building, the erection of which was completed some months ago. The structure has been laid out with special care and is admirably adapted to the requirements of their large and growing business. The building has a 50-foot frontage and is some 200 odd feet in depth, running through from Commerce to Cuthbert street, and comprising 513, 515 and 517 Commerce street. The building is of slow burning construction, and is completely equipped with inclosed staircases and elevator shafts and every modern fire protection. Fire has been guarded against as far as possible, not only by the use of the sprinkler system throughout the building, but also by the use of wire glass in all the windows making them practically impenetrable by fire from the outside. The sashes are fitted with the thermostatic device, which, when attacked by outside heat, immediately releases the weight and causes the sash to close. The doors are arranged to close automatically in the same manner. These precautions extend even to the exterior, and as a box factory is located in the rear, a brick wall six stories high has been built as a curtain, completely protecting the company's establishment against fire from that quarter.

The floors are 4¼ inches thick, and in storing their stock the company are no longer concerned with troublesome questions of loading weight, and now feel that in all appliances needed for the prompt and satisfactory dispatch of business, they are not surpassed by any Eastern Hardware jobber.

Fig. 1 shows the ground or office floor, and Fig. 2 gives an excellent idea of the offices and Cutlery room, the latter being shown at the right. It has been the aim of the company, as far as possible, to have their offices and sample room occupy the ground floor, the latter showing an especially complete and well arranged line of samples. The manner of arranging samples and the style of cases used are shown in Fig. 3. The city trade department is at the front of the store, while the out of town salesmen are provided for across the aisle. Back of these are the desks of the stenographers and typewriters, and still further back the buying, managing and bookkeeping departments. Attention might be called to the space set aside for the reception of visiting salesmen. A table with chairs is provided for them, while a supply of trade journals is kept on the table to enable salesmen to while away the time spent in waiting to see the buyers. The company have been rewarded by many appreciative words for thus thinking of the comfort of travelers.

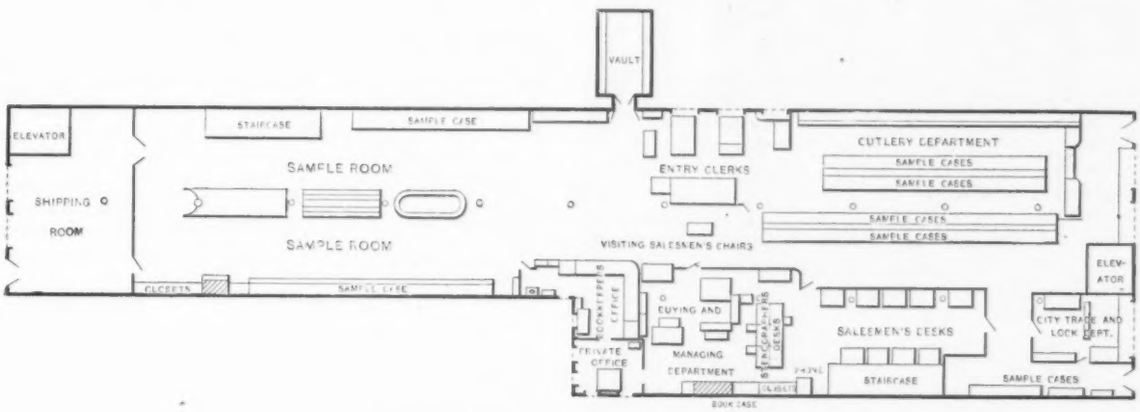


Fig. 1.—The Ground or Office Floor.

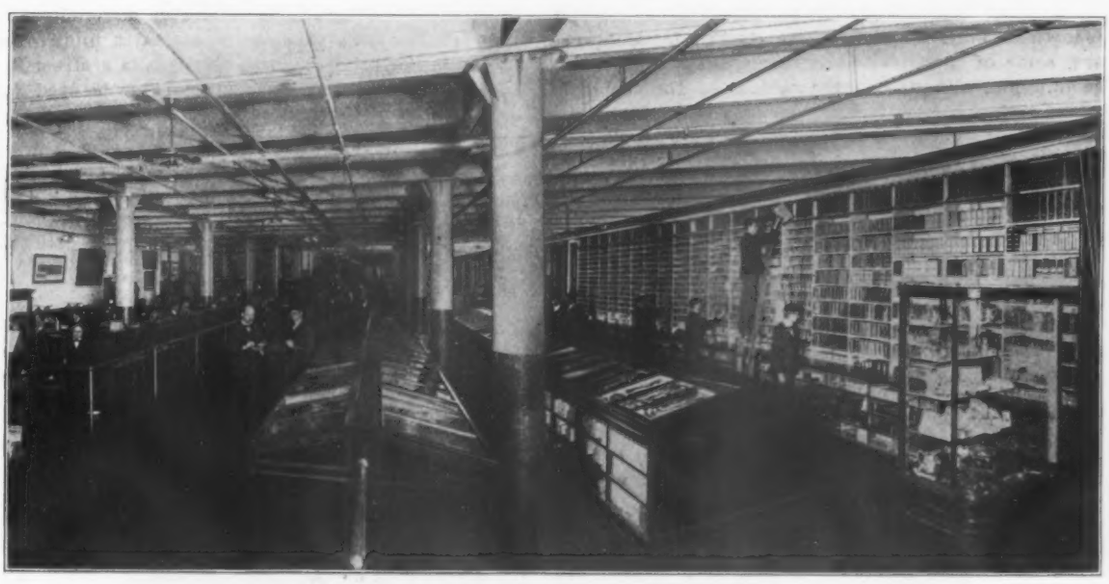


Fig. 2.—Offices and Cutlery Room.

The second floor is given up to the better class of Hardware, while a considerable portion of the shelving is occupied by a large stock of Disston's Saws. A part of this floor is also used for sampling bulky goods, such as Refrigerators, Screens, Mowers, &c. A feature of the second floor is the private office of Charles M. Biddle, which is shown in Fig. 4. Here some of the luxuries of life, including a marble shower bath, have been introduced, in the belief that the place where a man spends a large portion of his life need not be altogether

devoid of the comforts of home. This office is connected by telephone with the various parts of the store, and a telephone system is in use connecting all parts of the building.

Some originality is claimed for the way in which the

Fig. 3.—A Section of Sample Case.

third floor has been used for a packing room. This room is shown in Figs. 5 and 6, and embodies a number of ideas, some of which are original in their application. The building, although in the middle of the block, is lighted on both sides as well as in the front and rear, thus giving a well lighted and airy packing room.

The shelving which runs around the walls is very heavy and solid, and most of the heavier shelf goods, such as Carriage Bolts, Machine Bolts, Coach Screws, Strap and T-Hinges, Wrought Butts, Cast Butts, Screws, Screw Hook and Strap Hinges, are kept on this floor. The shelving throughout the store has been built on generous lines, so much so that the Strap Hinge bins each hold four barrels, or 2400 pounds. In filling orders it is simply necessary to take goods from the shelves or bins and lay them out on the packing floor to be shipped. A row of posts runs down the middle of the floor and uprights have been placed between them so that the goods are laid out on each side of the posts and separated in the usual manner by boards. In the rear of the room a platform is suspended from the ceiling, on which is kept a supply of boxes for the packers, the main supply, however, being kept on the sixth floor. As soon as the goods are packed they are immediately taken to the elevator and thence to the first floor, where they are assembled in the shipping room ready for shipment. Teams back up to the doors of this room and load directly from the floor. The shipping clerk has his desk on the third floor, in the packing department, and is equipped with a telephone, which keeps him in touch with the freight stations and shipping agencies.

The fourth floor is stocked with Shelf Hardware, long lines of shelving running the entire length. A new idea has been put in operation here and throughout the store, in numbering the shelves on the office building plan. For example, a certain section of shelving is numbered 406. The shelving or space directly above this on the fifth floor is numbered 506, while the same section on the third floor is 306. This system makes it an easy matter to direct a new boy to any portion of the store and also aids in keeping the stock in good order.

The fifth and sixth floors are filled with more bulky goods, such as Hoes, Rakes, Shovels, Lanterns, Scythes, Screens, &c., while the cellar is used for Wire and Cut Nails, Horse Shoes and Horse Shoe Nails, Tarred Paper and heavy goods.

The boilers for the heating apparatus and the electric and gas engines for the elevators are also in the basement. The front elevator is run by electricity and the rear elevator by a gas engine, so that a total failure of power is not probable, and as there is a street in both the front and rear, the front elevator is used for the reception of goods, while the shipping is done entirely at the back. The elevators have been built with special reference to handling bulky goods and the rear or shipping elevator is particularly generous in dimensions.

Fig. 4.—Private Office of Charles M. Biddle.

For many years the company experimented in va-

rious forms of keeping quotations left by visiting salesmen, letters quoting prices, contracts, &c. Files of various kinds were used, and the card system was tried. None of these seemed to answer the purpose. Finally it was decided to try the effect of using a scrap book, and accordingly books were secured, made of strong Manila paper, with about 250 pages each, measuring about 9½ x 11 inches each, as shown in Fig. 7. The method of operation is as follows: If a salesman calls and leaves a quotation, this is written directly in the book. If a contract is made the terms and prices of the contract are

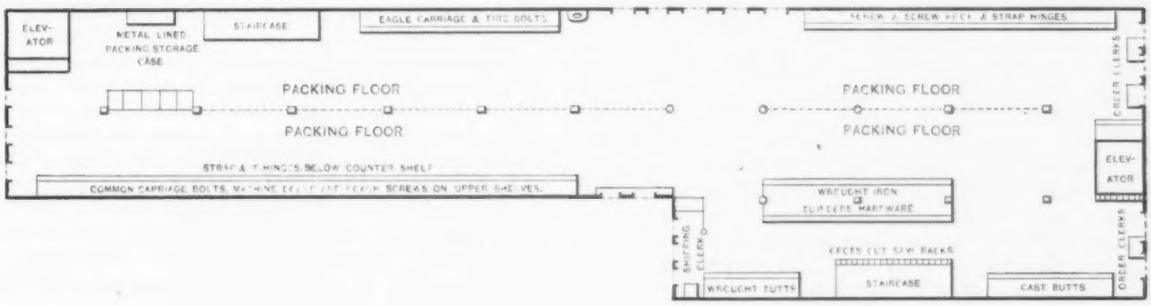


Fig. 5.—Floor Plan of Packing Room.

also written in the book, or, if signed in duplicate, a copy of the contract is pasted in the book. Any letter received quoting a price is also put in the book. Every day the book is indexed by one of the stenographers—a double index being used—so that goods are indexed both under the name of the article and also under the name of the party making the quotation. For example, Wire Nails are indexed under Nails, and also under the name of the American Steel & Wire Company. In this way quotations can be readily found at any time. The books

brief abstract of these prices is entered in a cost book, but the scrap books are constantly in use.

The company employ a large number of salesmen who travel as far South as Alabama and as far West as Nebraska, so that the territory covered is a very wide one.

It is seldom that an American business house can claim three living generations, but such was the case with the Biddle Hardware Company, until December 3 last, when Robert Biddle, the founder of the business, passed away in his eighty-ninth year. The founders of the firm were the brothers Robert and Wm. C. Biddle,

whose first acquaintance with the Hardware line was made in the days when almost everything was imported and American Hardware practically unknown. Early in the 30s Robert Biddle began his business career by engaging with the old Hardware firm of White & Abott, and later was with J. & J. B. Champion, where he served as clerk. On January 1, 1837, Robert Biddle went into partnership with his brother, Wm. C., as R. & W. C. Biddle, on Market—which was then known as High—street. In those days Market street had the picturesque feature

Fig. 6.—View of Packing Room.

run in chronological order, and as soon as a book is filled it is laid aside and the next number is taken. The books also can be used as a diary, and if it is wished to make a note of anything that has happened or to preserve some personal note such as the dissolution of a firm, or the death of some one in the trade, the circular is readily pasted in the book and becomes a permanent record. These books have now been used by the company for over six years, and form a library of ready reference which is quite valuable, the beauty of the system being found in the fact that upon referring to the quotation, the original contract is at once in evidence. A

of an open market in the center of the street, the end of the market being crowned with a cupola which fronted the river, a notable landmark. Merchants came to town twice a year, and their purchases were slowly conveyed from the city in canal boats on the newly opened canals or in Conestoga wagons along the highways of the North, West and South. The business of the two young men prospered, and in a few years they moved a little further up the street, buying the building 131 Market street, in the same block. This building was destroyed by fire in 1865. The firm then moved to 509 Commerce street, which for many years was their main building, although

from time to time other adjoining buildings were acquired as needed by the growing business. Later the two brothers admitted their respective sons, Clement M. and Charles M. Biddle, to an interest, and in 1866 the style of the firm was changed from R. & W. C. Biddle & Co. to Biddle Hardware Company, being the first Hardware jobbing house, we are advised, to adopt the title of "Hardware Company," but this was a change in name only, as the members of the firm, both before and after the change, were the same—namely, Robert, Wm. C., Clement M. and Charles M. Biddle. In spite of an apparently corporate name, they still remained a private firm as they do to-day. In 1872 the older men retired and the business was continued by their two sons. In 1873 Charles M. Biddle bought out the interest of Clement M. Biddle and became the proprietor of the business.

Charles M. Biddle, the present head of the firm, started in the business as a boy in 1861, and was admitted to the firm January 1, 1865, one month before he reached his majority. On the first day of 1876 James H. Ritter entered the store as a boy, passing through some of the various departments and soon finding his way into the office, where first as entry and later as profit clerk, he became conversant with prices and the Hardware market. Soon he was given the care of their large corps of salesmen, and in 1887 was admitted to an interest in the business, and ever since has been closely identified with the management. On April 1, 1873, Edward Knight began his career, passing through almost the entire store, thereby becoming familiar with every detail. Later he took the road as traveling salesman, and for many years held a large and important nearby trade. On January 1, 1890, he also was admitted to an interest, and has since taken up the pressing duties of correspondence and store administration. Meanwhile the two sons of Charles M. Biddle, Charles M. Biddle, Jr., and Robert Biddle, second, had been growing up to manhood. Entering the store as boys in 1898 and 1899 respectively, they familiarized themselves with the business, and with the beginning of 1902 became members of the firm.

During their long career the company have made a point of retaining old and valued employees, and but few changes have been made in the *personnel* of their force, so much so, that the aggregate service of ten men connected with the house, including three members of the firm, foots up 330 years.

STEEL SIGN WORKS.

THE GUNNING SYSTEM STEEL SIGN WORKS, with offices at 289 Wabash avenue and works at 2601 Archer avenue, Chicago, have issued an illustrated catalogue setting forth the evolution of the Gunning System. The illustrations are reproduced from photographs of Steel Signs which are in service in various parts of the country. With a view to the greatest adaptation, the sizes of the Steel Signs range from 1 x 2 feet to 10 x 16 feet, the latter, it is said, being the largest Sign manufactured by machinery. The wood frames of the Signs are manufactured with a special view to permanency. The frames and exposed molding are dipped in paint, which is also manufactured by the company. The colors are applied with gelatine rollers, insuring a heavy, even distribution without brush marks.

FAYETTE R. PLUMB, INCORPORATED.

ONE of the most progressive concerns engaged in the manufacture of Hardware and Edge Tools is that of Fayette R. Plumb, Incorporated, Philadelphia, Pa., which has grown from a small business founded in 1856 by Jonathan Yerkes at Frankford Station, then a suburb of Philadelphia, and employing 10 or 12 men. In 1869 Fayette R. Plumb took a half interest in the concern. By 1881 business had increased to such proportions that a larger plant was necessary. This was begun at Tucker and James streets on the New York Division of the Pennsylvania Railroad, an excellent location for shipment throughout the Eastern part of the United States, and especially so for export shipments. This plant was originally built to accommodate about 100 men. Since 1881 the growth of the business has been by leaps and bounds, and the plant is now nearly four times the size of that erected in 1881 and crowded to its utmost capacity. Extensive improvements providing for a 50 per cent. increase in capacity have been planned during the past year and are now under way. Export business with them in late years has very much increased, and Tools are being shipped to almost every country in South America, Africa, Europe, Asia and Australia. All the raw materials which enter into their Tools are made specially for them. The steel is specially made subject to methods which have been found best, and under such conditions a uniformity of quality is obtained. Handles for their Tools are made on the premises, hickory billets being cut especially for them in the best timber region of the South. Especial care is taken in testing and inspecting the Tools, so as to insure the highest quality and efficiency in use.

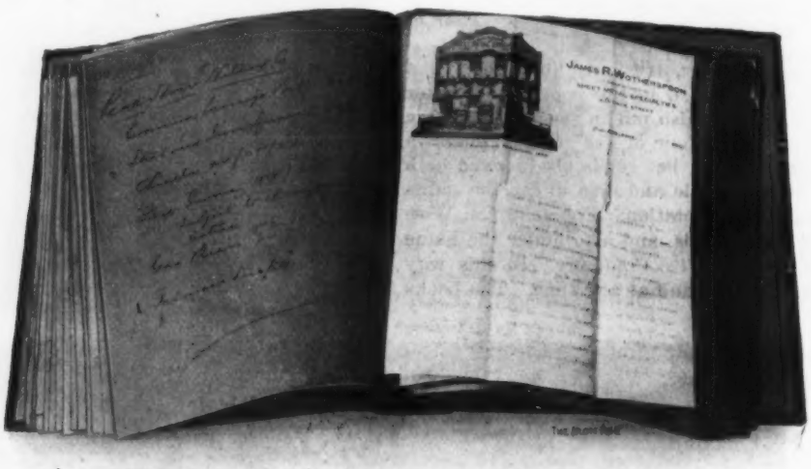


Fig. 7.—Quotation Scrap Book.

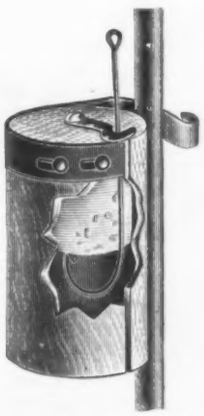
INDIANA MFG. COMPANY.

THE INDIANA MFG. COMPANY, Peru, Ind., in an illustrated booklet set forth 16 reasons why the North Star Refrigerator should find ready purchasers in the market. One of the most important features of the Refrigerator is the trap, a patented invention made of japanned iron. The illustrations are accompanied by dimensions and prices. Special attention is called to the Enameled Refrigerators, which have been on the market for two years. The company advise that the latter are not carried in stock, and hence a week's extra time should be allowed for enameling when specifica-

tions are forwarded. Attention is also called to the special department recently established in which the company are prepared to furnish on application plans and specifications for Refrigerators of any size and description.

Bishop's Combined Fish Hook Shield and Float.

A novel device for the convenience of fishermen is Bishop's combined fish hook shield and float, manufactured by A. W. Bishop & Son, Racine, Wis. The spring lock, as shown in the illustration, applies to any



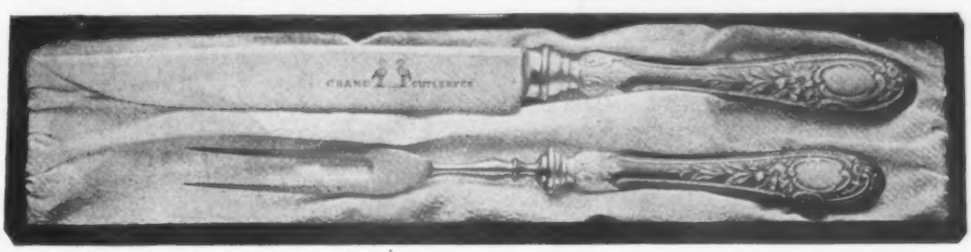
Bishop's Combined Fish Hook Shield and Float.

ordinary sized fish hook and any pole. It covers and locks the hook to the pole or rod securely when not in use. It is quickly applied, holds well, is nicely finished and can be carried in the vest pocket.

Game Carving Set.

Max Klaas, 298 Broadway, New York, manufacturer and importer of fine cutlery, is introducing the small carver set No. 4041, here illustrated. It is designed for light work, including the carving of game, steaks, chops, cold meats, &c. Special attention is called to the fact that each piece is drop forged from one piece of fine cutlery steel. The handles, which are excellent specimens of fine die work, are finished in old silver or French finish, and the goods carry the Crane brand, which is alluded to as a guarantee of quality with this house. The tines of the fork, which are of a delicate pattern, are highly polished and nickeled. They are put up in neat satin lined boxes, in either pairs or sets, the latter embracing a steel to match. An idea of the size is afforded by the following dimensions—viz.: The carver and steel are each 9¼ inches long over all, the knife blade being 5⅜ inches long, while the fork is 7¾ inches extreme length. The sets in individual boxes are packed six in a carton.

Daniel Hoffman, senior member of the Plymouth Hardware Company, Plymouth, Ohio, has just severed his connection with that concern, his interest being purchased by Frank Beaver, brother of Charles Beaver,



Game Carving Set No. 4041.

a member of the firm. The business will be continued under the same style. The firm are intending to erect a large and commodious building for their growing business.

Eccles' Ball Bearing Couplings.

The accompanying cuts show ball bearing couplings put on the market by Richard Eccles Company, Auburn, N. Y. Fig. 2 shows the coupling forged solid with the

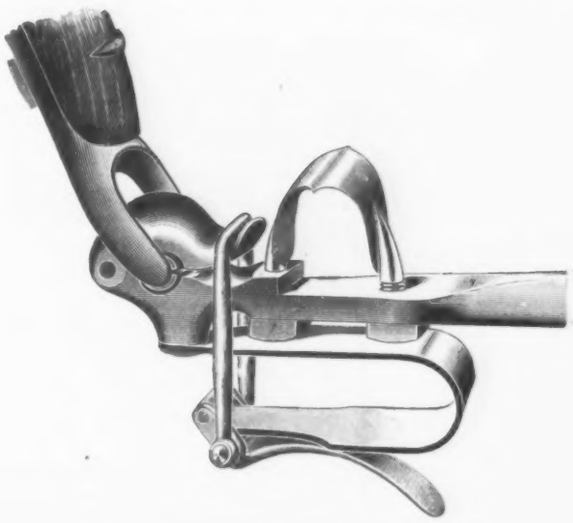


Fig. 1.—Eccles' Ball Bearing Coupling No. 25.

clip part that goes over the axle, and Fig. 1 shows the coupling to be fastened to the axle with a separate axle clip. This coupling is made with extension on the rear so that a step can be welded on, instead of having to put on the step with a separate clip. With this style of

Fig. 2.—Eccles' Ball Bearing Coupling with Solid Clip.

coupling all that is necessary to do to remove the shafts is to throw forward the lever, which releases the upper cap and allows the shafts to be removed at once. It is explained that this coupling is most desirable for carriage builders, because the spring can be turned around so as to be out of the way for turning up the nuts of the clip part, and trimming off the ends of the pins. After the coupling is clipped to the axle the spring can be turned into position and it is then ready for use.

The Perfect Lemon Squeezer.

The lemon squeezer illustrated in Fig. 1 has a highly polished frame, nickel plated. The parts that come in contact with the lemon are made of malleable iron, heavily coated with tin to prevent corroding. The construction is such that the squeezer proper can be readily detached from the bracket or holder for cleaning by lifting it out of the socket, when it can be rinsed off in water, and replaced in position without the use of tools. The squeezer is referred to as getting all the juice, and getting it easily, as being neat in appearance and reliable. It is designed for bars, hotels, restaurants, or wherever a stationary squeezer can be used. The squeezer shown in Fig. 2 is in all respects the same as that shown in Fig. 1, except that it is designed to fasten on a wall or an ice box. The squeezers are put up for market one each in a paper box, and half a dozen in a substantial wooden case. The squeezers are put on the market by the Arcade Mfg. Company, Freeport, Ill.

Fig. 1.—The Perfect Lemon Squeezer No. 1.

Fig. 2.—The Perfect Squeezer No. 10, Fastened to Wall.

The Iron Age Combined Garden Tool.

The Bateman Mfg. Company, Grenloch, N. J., are placing upon the market the No. 15 Iron Age combined single wheel hoe, hill and drill seeder, as shown in the accompanying cut. The tool is referred to as filling every requirement for use in a small kitchen garden from the beginning of a season to its very close. Its change from a seed drill to a wheel hoe, or the reverse, can be made very quickly. The company are just issuing a large and complete new catalogue, in which is illustrated and described many other farm and garden implements. The catalogue will be mailed to any one making application.

The Iron Age Combined Garden Tool.

The Alaska Steel Snow Shovel.

The Avery Stamping Company, Cleveland, Ohio, have brought out the snow shovel shown in the accompanying cut. These shovels are made in both long and malleable D handle styles, the blades being of a specially designed shape and drop forged with hollow back pattern socket all in one solid piece. While the shovels are intended particularly for snow shoveling, they may be used for any light purposes around the household, stables, &c. The goods are shipped in bundles containing half a dozen shovels, each being attractively labeled.

The Alaska Steel Snow Shovel.

The Crescent Tough Steel Shoe Plates.

The Crescent Shoe & Heel Plate Works, Richmond, Va., are offering the tough steel shoe plates shown herewith. They are designed for heels or soles, and to be put on before the heel has been run down or the sole worn. Among the points of excellence the following are mentioned: That the barbs being on the inside curve the plate goes on flush with the edge of the sole or heel; that being thin steel it protects without disfiguring the

The Crescent Tough Steel Shoe Plates.

shoe; that being flat the foot rests firm, and that it cannot break, stays on and wears well. The plates are made in two sizes: No. 3 for men's shoes and No. 2 for ladies' and children's shoes.

The Elite Gas Jet Flat Iron.

The accompanying cut represents a gas jet flat iron, which can be heated by slipping it over an ordinary gas burner. It is constructed on the Bunsen burner principle, the air being furnished by a hole in the branch of the handle leading to the flame chamber. It is explained that the handle does not get hot, and that two or three minutes suffices to heat the iron. The iron is nickel plated and is made to retail at $1. It is offered by the New York Agricultural Company, 51 Cliff street, New York.

The Elite Gas Jet Flat Iron.

The Wilcox Triumph Wire Stretcher.

The Wilcox Mfg. Company, Aurora, Ill., have placed on the market the wire stretcher shown in the accompanying illustrations. It is a continuous stretcher, the operator not being required to stop work to take up the slack for moving the lever back and forth. The point is made that ordinary stretchers have their capacity limited to about 6 inches, but that this continuous stretcher has almost unlimited capacity. The rods and handles are of steel and the jaws or clamps of malleable iron.

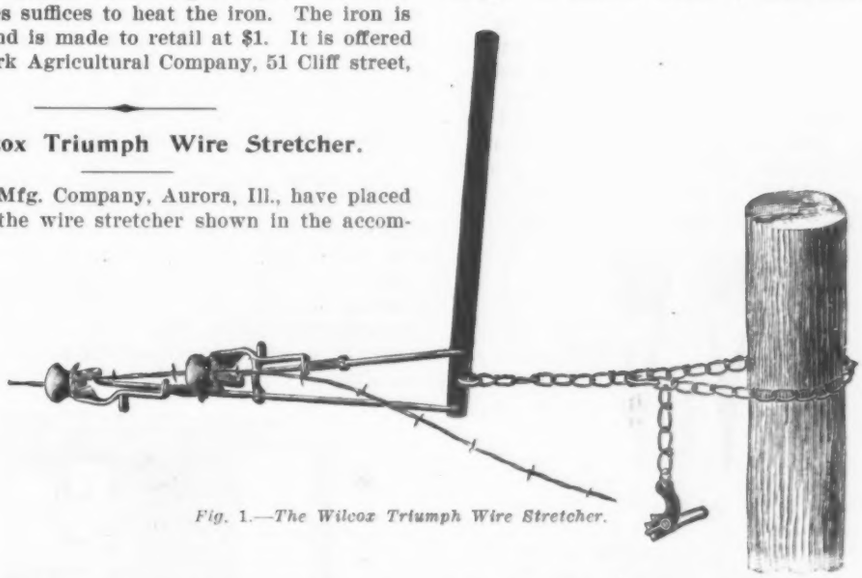


Fig. 1.—The Wilcox Triumph Wire Stretcher.

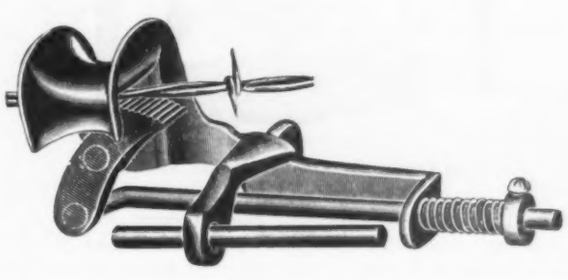


Fig. 2.—Enlarged View of Jaws on Wilcox Stretcher.

Cold Cabinet No. 3150.

The cold cabinet shown in the accompanying cut is made with a solid oak exterior, lined with ½-inch plate glass. The cabinet is supplied with drawers on one side, and is made in four sizes. It is offered by the Wilke Mfg. Company, Anderson, Ind., who refer to it as a unique departure in the line of refrigerators.

Cold Cabinet No. 3150.

Method of Packing Carpet Sweepers.

The accompanying illustration shows a broken view of the cardboard box used by the National Sweeper Company, Marion, Ind., in packing their carpet sweepers. Attention is called to the pieces of strawboard at each end of the sweepers, which are heavy, stiff boards placed between the sweeper wheels and the body, wide enough to extend about ¼ inch above the top or finished surface of the sweeper box. These prevent the highly finished surface of the sweeper box coming in contact with the surface of the carton should the box be turned upside down by accident.

Method of Packing Carpet Sweepers.

Witte's Patent Standard Razor Gauge.

Alexis Witte, 81 Warren street, New York, has just perfected and put on the market Witte's patent standard razor gauge, illustrations of which are here given. This device, the cut of which is actual size, is designed

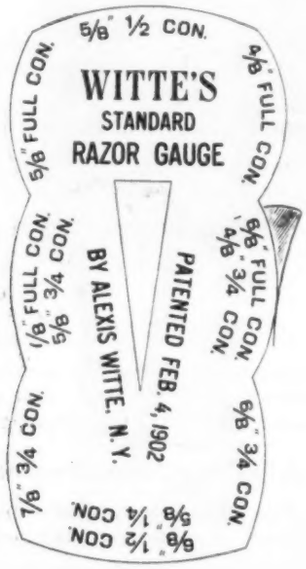


Fig. 1.—Witte's Standard Razor Gauge, Actual Size.

not only for manufacturing cutlers, but dealers and salesmen, who by its use can instantly determine the proportion of concavity—*i. e.*, full, three-quarter, half or quarter concave, the efficiency of the razor depending largely on the accuracy and evenness of the grinding. The outer arcs or convex surfaces of the gauge are self explained by the deeply etched and black enameled letters on the heavy spring tempered high grade German silver of which it is made. The central opening is used for inserting a razor blade, to ascertain whether or not it is properly proportioned, each part to the other from

Fig. 2.—Method of Using the Triangular Opening.

back to cutting edge. This is emphasized in Fig. 2, in which the first or left hand sectional view shows a ¾-inch blade of proper proportions, the center cut indicating that the back is too thick in proportion to the width, as only the two sides of the back touch the sides of the triangular slot, the edge of the razor not reaching the point in the lower part of the triangle. The drawing at the extreme right, on the other hand, indicates that the back of the razor is too thin, as only one side of the back touches the side of the opening. As a three-quarter concaved razor is worth less than one full concaved and so on, this gauge enables even the inexpert to intelligently discriminate between razors that are standard and those not as represented. The principles of the gauge, we are advised, conform to the best razor practice of recognized standard manufacturers.

U. S. A. Liquid Pistol.

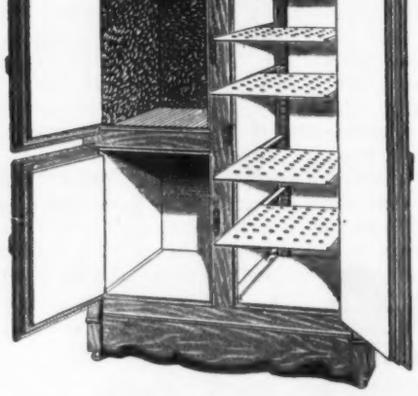
Parker, Stearns & Sutton, 230 South street, New York, have just put on the market the U. S. A. liquid pistol, which in the present form is a marked improvement on its two predecessors, which are well known to the trade. The pistol is of a neat pattern, having an English bull dog appearance, and is nickel plated. Pistols of this character of their manufacture heretofore have been loaded and fired by pressing the interior rubber bulb, through an opening purposely left in the handle. In the U. S. A., however, the action is entirely confined to the trigger, a pull on which both loads and discharges the pistol. When empty, a pressure of the trigger forces the air out of the bulb, when, by inserting the pistol muzzle in a glass of water and releasing the pressure on the trigger, the vacuum in the reservoir

U. S. A. New Model Liquid Pistol.

is filled, the bulb and a fine rubber tube reaching to the muzzle being one piece of good quality rubber. The pistol as now made is of much more substantial character, the metallic parts being iron castings instead of steel stampings as previously, the extreme length being 5 inches. The pistol is preferably used with plain water, which, properly aimed, will stop a dog or other animal, although various solutions not permanently harmful could be used by unescorted women, bicyclists, cashiers and others, if deemed necessary. There are over 20 shots in one loading.

The Leonard Sliding Adjustable Shelves.

The Grand Rapids Refrigerator Company, Grand Rapids, Mich., have recently put on the market sliding adjustable shelves, as shown herewith, this improvement being used only on the Leonard Cleanable refrigerator. Adjusting the shelves without the aid of tools is accomplished by simply changing the guide slips from one slot to another. The close adjustment gives opportunity to put in another shelf for pies, &c., thus increasing the capacity of the refrigerator without further



The Leonard Sliding Adjustable Shelves.

cost. In their 1903 catalogue the company call special attention to their line of genuine porcelain lined refrigerators, which are made in ten different styles of various kinds of finish. In making porcelain linings sheet steel is first cut and formed to fit the refrigerators, then cleaned with acids and the porcelain is ground to the finest powder; the powder is dried to the metal and afterward put into a furnace, where it is fused on the sheet metal at a temperature of 2500 degrees F.

Current Hardware Prices.

REVISED DECEMBER 29, 1902.

General Goods.—In the following quotations General Goods—that is, those which are made by more than one manufacturer, are printed in *Italics*, and the prices named, unless otherwise stated, represent those current in the market as obtainable by the fair retail Hardware trade, whether from manufacturers or jobbers. Very small orders and broken packages often command higher prices, while lower prices are frequently given to larger buyers.

Special Goods.—Quotations printed in the ordinary type (Roman) relate to goods of particular manufacturers, who are responsible for their correctness. They usually represent the prices to the small trade, lower prices being obtainable by the fair retail trade, from manufacturers or jobbers.

Range of Prices.—A range of prices is indicated by means of the symbol @. Thus 33⅓@33⅓&10% signifies that the price of the goods in question ranges from 33⅓ per cent. discount to 33⅓ and 10 per cent discount.

Names of Manufacturers.—For the names and addresses of manufacturers see the advertising columns and also THE IRON AGE DIRECTORY, issued April, 1902, which gives a classified list of the products of our advertisers and thus serves as a DIRECTORY of the Iron, Hardware and Machinery trades.

Standard Lists.—A new edition of "Standard Hardware Lists" has been issued and contains the list prices of many leading goods.

Additions and Corrections.—The trade are requested to suggest any improvements with a view to rendering these quotations as correct and as useful as possible to Retail Hardware Merchants

Adjusters' Blind—

Domestic, ₱ doz. $3.00 ..... 33⅓%
North's 10%
Zimmerman's—See *Fasteners, Blind.*

Window Stop—

Ives' Patent ..... 25&5%
Taplin's Perfection ..... 25&5%

Ammunition—See *Caps, Cartridges, Shells, &c.*

Anvils—American—

Arm and Hammer, Wrought ₱ lb 8¼@8¾¢
Buel Patent Trenton ..... ₱ lb 9½@9¾¢
Eagle Anvils ..... ₱ lb 7¼@7¾¢
Hay-Budden, Wrought ..... 9¼@9¾¢
Horseshoe brand, Wrought ..... 9¼@9¾¢

Imported—

Peter Wright & Sons ..... ₱ lb 10½¢

Anvil, Vise and Drill—

Millers Falls Co., $18.00 ..... 50&10%

Apple Parers—See *Parers, Apple, &c.*

Aprons, Blacksmiths'—

Hull Bros. Co.:
Lots of 1 doz 25%
Smaller Lots 20%
Lots of 3 doz 30%

Augers and Bits—

Com. Double Spur ..... 70&10@75%
Boring Machine Augers ..... 70&10@75%
Car Bits, 12-in. twist ..... 60@60&10%
Jennings' Pattern Auger Bits ..... 50&10&5@60%
Ford's Auger and Car Bits 40%
Forstner Pat. Auger Bits 25%
C. E. Jennings & Co.:
No. 10 ext. lip, R. Jennings' list 25&10%
No. 30, R. Jennings' List. 40&7½&10%
Russell Jennings' ..... 25&10&2½%
L'Hommedieu Car Bits ..... 15&10%
Mayhew's Countersink Bits 45%
Millers' Falls ..... 50&10&7½%
Pugh's Black 20%
Pugh's Jennings' Pattern 35%
Snell's Auger Bits 60%
Snell's Bell Hangers' Bits ..... 50&10%
Snell's Car Bits, 12-in. twist 60%
Wright's Jennings Bits (R. Jennings' list) 50%

Bit Stock Drills—

Standard List ..... 65&5@70%

Expansive Bits—

Clark's small, $15; large, $26 ..... 50&10%
Lavigne's Clark's Pattern, No. 1, ₱ doz., $26; No. 2, $18 ..... 50&10%
C. E. Jennings & Co., Steer's Pat. 25&10%
Swan's 60%

Gimlet Bits—

Common Double Cut ..gro. $2.50@3.00
German Pattern ..... gro. $4.00@4.25

Hollow Augers—

Bonney Pattern, per doz. $11.00@11.50
Ames ..... 25&10%
New Patent ..... 25&10%
Universal 20%
Wood's Universal 25%

Ship Augers and Bits—

Ford's 40%
Snell's 40%
C. E. Jennings & Co.:
L'Hommedieu's ..... 15&13%
Watrous' ..... 33⅓&10%

Awl Hafts, See *Hafts, Awl.*

Awls—

Brad Awls:
Handled ..... gro. $2.75@3.00
Unhandled, Shouldered .gro. 63@66c
Unhandled, Patent ..... gro. 66@70c
Peg Awls:
Unhandled, Patent ..... gro. 31@34c
Unhandled, Shouldered .gro. 65@70c
Scratch Awls:
Handled, Common ..gro. $3.50@4.00
Handled, Socket ..gro. $11.50@12.00
Hurwood 40%

Awl and Tool Sets—See *Sets, Awl and Tool.*

Axes—

First Quality, factory brands ... $6.00
First Quality, jobbers' brands ... $5.50
Second Quality ..... $5.00@5.25

Axle Grease—See *Grease, Axle.*

Axles—*Iron or Steel*

Concord, Loose Collar .... 4½@5c
Concord, Solid Collar .... 4¾@5½c
No. 1 Common ..... 3¾@4 c
No. 1¼ Com. New Style .. 3¼@4 c
No. 2, Solid Collar ..... 4¼@4½c
Nos. 11 to 14 ..... 65&10&5@70&5%
Nos. 15 to 18 ..... 75@75&10%
Nos. 19 to 22 ..... 75@75&10%
} 5% cash 10 days.

Boxes, Axle—

Common and Concord, not turned .. lb. 4½@4¾¢
Common and Concord, turned ... lb. 4¾@5c
Half Patent ..... lb. 8@9c

Balances—Sash—

Caldwell new list 50%
Pullman's 60%

Spring—

Spring Balances ..... 50&10@60%
Chatillon's:
Light Spg. Balances ..... 40&10%
Straight Balances 40%
Circular Balances 50%
Large Dial 30%
Pelouze 50%

Barb Wire—See *Wire, Barb.*

Bars—Crow—

Steel Crowbars, 10 to 40 lb., per lb .. 2¾@3c

Towel—

No. 10 Ideal, Nickel Plate ..... ₱ gro, $8.50
No. 20 Ideal, Brass Finish ..... ₱ gro. $8.50

Baskets—

Hoffman's Brick Baskets ..... each $3.25

Beams, Scale—

Scale Beams, List Jan. 12, '85 .50&10%
Chattillon's No. 1 ..... 30%
Chattillon's No. 2 ..... 40%

Beaters—Egg—

National Mfg. Co.: ₱ gro.
No. 1 Dover, Family size $7.00
No. 2 Dover, Hotel size 14.00
Taplin Mfg. Co.: ₱ gro.
No. 60 Improved Dover $6.50
No. 75 Improved Dover $7.50
No. 75-2 Imp'd Dover, Tin'd $9.00
No. 100 Improved Dover $8.00
No. 102 Improved Dover, Tin'd .. $9.50
No. 150 Improved Dover, Hotel .$15.00
No. 152 Imp'd Dover, Hotel, T'l .$17.00
No 200 Imp'd Dover Tumbler $9.00
No.202, Imp'd Dover Tumbler, Tin'd $10.60
No. 300, Imp'd Dover Mammoth, ₱ doz $27.00
Lyon's, Standard size ..... ₱ doz. $1.75
Wonder (S. S. & Co.) ..... ₱ gro. $6.00

Bellows—

Blacksmith, Standard List. 70@70&10%

Blacksmiths'—

Inch..	*30*	*32*	*34*	*36*	*38*	*40*
Each	*$3.50*	*3.75*	*4.25*	*4.80*	*5.35*	*6.15*

Extra Length:
Each .$4.00 4.55 5.10 5.60 6.40 7.50

Molders—

Inch..	*9*	*10*	*11*	*12*	*14*	*16*
Doz...	*$6.75*	*7.25*	*8.50*	*9.50*	*12.00*	*14.50*

Hand—

Inch...	*7*	*8*	*9*	*10*	*12*
Doz....	*$4.75*	*5.25*	*5.75*	*6.25*	*7.00*	*8.00*

} Net Prices.

Bells—Cow—

Ordinary goods ..... 75&5@75&10%
High grade ..... 70@70&10%
Jersey ..... 75&10%
Texas Star 50%

Door—

Abbe's Gong 45%
Barton Gong 55%
Home, R. & E. Mfg. Co.'s ..... 55&10%
Lever and Pull, Sargent's .... 60&10&10%
Yankee Gong 35%

Hand—

Hand Bells, Polished ....60&5@60&10%
White Metal ..... 55@55&10%
Nickel Plated ..... 50@50&5%
Swiss ..... 60@60&10%
Cone's Glone Hand Bells ... 33⅓@33⅓&10%
Silver Chime ..... 33⅓@33⅓&10%

Miscellaneous—

Farm Bells ..... lb. 2@2¼c
Steel Alloy Church and School 60%
National Bell Foundry Co.:
Superior Cast Steel Church and School Bells ..... 50&10&5@60%
American Tube & Stamp'g Co. Gongs. 70%
Trip Gong Bells ..... 55&10@60%

Belting—Rubber—

Agricultural (Low Grade) .75&10@80%
Common Standard ..... 75@75&10%
Standard ..... 70@70&10%
Extra ..... 60&10&5%
High Grade ..... 50&10@50&10&5%
Boston Belting Co.:
Seamless Stitched Imperial ..... 45&5%
Boston ..... 50&5%
Niagara ..... 60&5%

Leather—

Extra Heavy, Short Lap ....60@60&5%
Regular Short Lap 60&10@60&10&10%
Standard ..... 70@70&5%
Light Standard ..... 70&10%
Cut Leather Lacing ..... 60&10%
Leather Lacing Sides, per sq. ft. .18c

Cotton—

Rossendale-Reddaway B. & H. Co.:
Sphinx Brand ..... 60&10%
Durable Brand 70%

Bench Stops—See *Stops, Bench*

Benders and Upsetters, Tire—

Detroit Perfected Tire Bender 40%
Green River Tire Benders and Upsetters 20%
Detroit Stoddard's Lightning Tire Upsetters, No. 1, $3.75; No. 2, $6.50; No. 3, $9.50; No. 4, $14.75; No. 5, $18.75.

Bicycle Goods—

John S. Leng's Son's 1902 list:
Chain 50%
Parts 50%
Spokes 50%
Tubes 60%

Bits—

Auger, Gimlet, Bit Stock Drills, &c.—See *Augers and Bits.*

Bit Holders—See *Holders.*

Blind Adjusters—See *Adjusters, Blind.*

Blind Fasteners—See *Fasteners, Blind.*

Blind Staples—See *Staples, Blind.*

Blocks—Tackle—

Common Wooden ..... 70&10@75%
Cleveland Steel ..... 60@60&10%
Hollow Steel Blocks, with Forbes' Patent Sheaves ..... 50&10%
Lane's Patent Automatic Lock and Junior 30%
Stowell's Novelty, Mal. Iron ..... 50&10%
See also *Machines, Hoisting.*

Boards Stove—

Zinc, Crystal, &c ..... 40&10@50%

Bolts—

Carriage, Machine &c.—

Common, list Feb. 1, '02 ....60&5@..%
Norway Iron, $3.00, list Jan. 1, '98 ..... 80@80&5%
Phila. Eagle, $3.00 list May 24, '99 .... 80@80&5%
Bolt Ends, list Feb. 14, '95 .65&2½@..%
Machine, list Oct. 1, '99 ..... 65@..%
Machine with C & T. Nuts ..... 60&2½@..%

NOTE.—*Jobbers are in many cases underselling the manufacturers.*

Door and Shutter—

Cast Iron Barrel, Round Brass Knob:

Inch	*3*	*4*	*5*	*6*	*8*
Per doz	*$0.26*	*.30*	*.39*	*.47*	*.65*

Cast Iron Spring Foot:

Inch	*6*	*8*	*10*
Per doz	*$1.00*	*1.25*	*1.75*

Cast Iron Chain, Flat, Japanned:

Inch	*6*	*8*	*10*
Per doz	*$0.75*	*1.05*	*1.30*

Cast Iron Shutter, Brass Knobs:

Inch	*6*	*8*	*10*
Per doz	*$0.57*	*.80*	*1.00*

Wrought Barrel Brass Knob:

Inch	*3*	*4*	*5*	*6*	*8*
Per doz	*$0.44*	*.50*	*.61*	*.70*	*1.28*

Wrought Barrel ...75&10@75&10&10%
Wrought " Bronzed .50&5@50&10%
Wrought Flush, B. K. .50&10@60&10%
Wrought Shutter ...40&10&10@60&5%
Wrought Square Neck .....50@50&10%
Wrought Sunk ..... 50@50&10%
Ives' Patent Door 60%

Stove and Plow—

Plow ..... 60@..%
Stove ..... 77½@77½&10%

Tire—

Common 77½%
Norway Iron ..... 80@80&5%
American Screw Company:
Norway Phila., list Oct. 16, '84 ....82½%
Eagle Phila., list Oct. 16, '84 ..... 85%
Bay State, lb., Dec. 28, '99 ..... 77½%
Franklin Moore Co.:
Norway Phila., list Oct. 16, '84 ..82½%
Eagle Phila., list Oct. 16, '84 ..... 85%
Eclipse, list Dec. 28, '99 ..... 77½%
Port Chester Bolt & Nut Company
Empire, list Dec. 28, '99 ..... 77½%
Keystone Phila. list Oct. '84 ..... 85%
Norway Phila., list Oct. '84 ..... 82½%
Upson Nut Co.:
Tire Bolts 77½%

Borers, Tap—

Borers Tap, Ring, with Handle:

Inch	*1¼*	*1½*	*1¾*	*2*
Per doz	*$4.30*	*5.00*	*5.75*	*7.25*
Inch			*2¼*	*2½*
Per Doz			*$8.65*	*11.50*

Enterprise Mfg. Co., No. 1, $1.25; No. 2, $1.65; No. 3, $2.50 each 25%

Boring Machines—See *Machines, Boring.*

Boxes, Mitre—

C. E. Jennings & Co ..... 25&10%
Langdon ..... 15&10%
Schatz 40%
Seavey's, per doz., $30 ..... 40%

Braces—

NOTE.—*Most Braces are sold at net prices.*

Common Ball, American ..$1.15@1.25
Barber's ..... 50&10&10@60&10%
Fray's Genuine Spofford s 60%
Fray's No. 70 to 120, S1 to 123, 207 to 414 ..... 60%
C. E. Jennings & Co ..... 50&5&10%
Mayhew's Ratchet 60%
Mayhew's Quick Action Hay Patent .. 50%
Millers Falls Drill Braces ..... 25&10%
P. S. & W. Co. Peck's Patent 60&10&65%

Brackets—

Wrought Steel ..... 75&10@80%
Bradley's Wire Shelf:
Full cases ..... 80&10&10%
Broken cases ..... 80&10%
Griffin's Pressed Steel 80%
Griffin's Folding Brackets ..... 70&10%

Bright Wire Goods—See *Wire and Wire Goods.*

Broilers—

Wire Goods Co ..... 75@75&10%

Buckets, Well and Fire—See *Pails*

Bucks, Saw—

Hoosier ..... ₱ gro. $36.00

Bull Rings—See *Rings, Bull.*

Butts—Brass—

Wrought list Sept., '96 .....30@30&5%
Cast Brass, Tiebout's 50%

Cast Iron—

Fast Joint, Broad ..... 50@50&10%
Fast Joint, Narrow ..... 50@50&10%
Loose Joint ..... 70&5@70&10%
Loose Pin ..... 70&5@70&10%
Mayer's Hinges ..... 70&5@70&10%
Parliament Butts ..... 70&5@70&10%

Wrought Steel—

Table and Back Flaps 60%
Narrow and Broad 60%
Inside Blind ..... 66&10%
Loose Pin ..... 60&10%
Loose Pin, Ball and Steeple Tip 75%
Japanned, Ball Tip Butts ... 60%
Bronzed Wrt. Nar. and Inside Blind Butts ..... 45&20@45&25%

} Extra 25&10 @25&10&5%

Cages, Bird—

Hendryx, Brass:
3000, 5000, 1100 series 5%
1200 series ..... 33⅓&5%
200, 300, 600 and 900 series ..... 40&10%
Hendryx Bronze:
700, 800 series ..... 40&10%
Hendryx Enameled ..... 40&10%

Calipers—See *Compasses, Calks.*

Calks, Toe and Heel—

Blunt, 1 prong ..... per lb. 4@4½c
Sharp, 1 prong ..... per lb. 4½@4½c
Perkins' Blunt Toe ..... ₱ lb 3½¢
Perkins' Sharp Toe ..... ₱ lb 4 ¢

Cannons—

Breech Loading, 32 cal. Cartridge, Toy Cannons ..... per doz. $2.00

Can Openers—See *Openers, Can*

Cans, Milk—

	5	8	10 gal.	
Illinois Pattern.	$1 50	2.00	2.25	each.
Iowa Pattern...	....	2.35	2.50	each.
	20	30	40	qts.
New York Patt'rn	1.65	2.40	2.75	each.
Baltimore Patt'rn	....	1.80	2.00	each.

Cans, Oil—

Buffalo Family Oil Cans:

3	5	10 gal.
$48.00	60.00	120.00 gro

Caps—Percussion—

Eley's E. B.	*60c*
G. D.	*per M 32@34c*
F. L.	*per M 42@..c*
G. E.	*per M 47@50c*
Musket	*per M 62@..c*

Primers—

Berdan Primers, $1.00 per M 5%
B. L Caps (Sturtevant Shells) $1.00 per M 5%
All other primers per M $1.22@$1.37

Carpet Stretchers—
See *Stretchers, Carpet.*

Cartridges—
Blank Cartridges:
38 C. F., $5.50 ..10c&5%
38 C. F., $7.00 ..10c&5%
22 cal. Rim, $1.50 ..10c&5%
32 cal. Rim, $2.75 ..10c&5%
B. B. Caps, Con., Ball Swgd ..$1.90
B. B. Caps, Round Ball ..$1.40
Central Fire ..25%
Target and Sporting Rifle ..15c&5%
Primed Shells and Bullets ..15c&10%
Rim Fire Sporting ..50%
Rim Fire, Military ..15c&5%

Casters—
Bed ..70@70c&10%
Plate ..60@60c&5%
Philadelphia ..75@75c&10%
Boss ..70c&10%
Boss Anti-Friction ..70c&10%
Martin's Patent (Phoenix) ..45%
Payson's Anti-Friction ..70c&10c&10%
Standard Ball Bearing ..45%
Tucker's Patent Low list ..30%

Cattle Leaders—
See *Leaders. Cattle.*

Chain, Coil—
American Coil, Jobbers' Shipments:

3-16	¼	5-16	⅜	7-16	½ 9-16
3.70	6.35	5.10	4.20	4.00	3.90 3.85
⅝	¾	⅞	1 to 1¼ inch.		
3.80	3.75	3.70	3.60 per 100 lb.		

German Coil ..60&10c&10%

Halters and Ties—
Halter Chains ..60c&10@60c&10c&10%
German Halter Chain, list July 10, '97 ..60c&10@60c&10c&10%
Cow Ties ..50c&10@60%

Trace, Wagon, &c.—
Traces, Western Standard: 100 pair
6½—6-3, Straight, with ring ..$50.00
6½—6-2, Straight, with ring ..$51.00
6½—8-2, Straight, with ring ..$54.00
6½—10-2, Straight, with ring ..$59.00
Add 2¢ per pair for Hooks.
Twist Traces 2¢ per pair higher than Straight Link.
Trace, Wagon and Fancy Chains ..50&10@50c&10c&10%

Miscellaneous—
Jack Chain, list July 10, '93:
Iron ..60c&10@60c&10c&10%
Brass ..60c&10@60c&10c&10%
Safety Chain ..70c&10@75c&5%
Gal. Pump Chain ..lb. 4¾@4¾c
Covert Mfg. Co.
Breast ..35&2%
Halter ..35&2%
Heel ..35&2%
Rein ..35&2%
Stallion ..35&2%
Covert Sad. Works:
Breast ..70%
Halter ..70%
Hold Back ..70%
Rein ..70%
Oneida Community:
Am. Coil and Halters ..40@45&5%
Am. Cow Ties ..45@50%
Eureka Coil and Halter ..45@50&5%
Niagara Coil and Halters ..45@50&5%
Niagara Cow Ties ..45&5@50&10&5%
Wire Dog Chains ..45@50&5%
Wire Goods Co.:
Dog Chain ..70&10%
Universal Dbl-Jointed Chain ..50%

Chalk—(From Jobbers.)
Carpenters' Blue ..gro. 40@45c
Carpenters', Red ..gro. 35@40c
Carpenters', White ..gro. 30@35c
See also Crayons.

Chalk Lines—See *Lines.*

Checks, Door—
Bardsley's ..40&10%
Columbia ..50&10%
Eclipse ..60%

Chests, Tool—
American Tool Chest Co.:
Boys' Chests, with Tools ..55%
Youths' Chests, with Tools ..40%
Gentlemens' Chests, with Tools ..30%
Farmers', Carpenters', etc, Chests, with Tools ..20%
Machinists' and Pipe Fitters' Chests, Empty ..50%
C. E. Jenning. & Co.'s Machinists' Tool Chests ..33⅓&10%

Chisels—
Socket Framing and Firmer
Standard List ..70@70c&10%
Buck Bros ..30%
Charles Buck ..30%
C. E. Jennings & Co. Socket Firmer No. 10 ..60&10%
C. E. Jennings & Co. Socket Framing No. 15 ..60&10%
Swan's ..70%
L. & I. J. White ..30@30&5%

Tanged—
Tanged Firmers ..40c&5@40&10%
Buck Bros ..30%
Charles Buck ..30%
C. E. Jennings & Co. Nos. 191, 181 ..16⅔&10%
L. & I. J. White, Tanged ..35&5%

Cold—
Cold Chisels, good quality ..lb. 13@15c
Cold Chisels, fair quality ..lb. 11@12c
Cold Chisels, ordinary ..lb. 8@9c

Chucks—
Beach Pat., each $8.00 ..35&5%
Massey's Planer and Milling ..15&20%
Pratt's Positive Drive ..25%
Empire ..25%
Hacksmiths' ..25%
Skinner Patent Chucks:
Combination Lathe Chucks ..40%
Drill Chucks, Patent and Standard ..30%
Drill Chucks, New Model ..25%
Independent Lathe Chucks ..40%
Improved Planer Chucks ..25%
Universal Lathe Chucks ..40%
Face Plate Jaws ..40%
Standard Tool Co.:
Improved Drill Chuck ..45%
Union Mfg. Co.:
Combination ..40%
Cam Drill ..30%
Geared Scroll ..30%
Independent ..40%
Union Drill ..30%
Universal ..40%
Face Plate Jaws ..35%
Wescott Patent Chucks:
Lathe Chucks ..50%
Little Giant Auxiliary Drill ..40%
Little Giant Double Grip Drill ..40%
Little Giant Drill, Improved ..40%
One Jaw Drill ..40%
Scroll Combination Lathe ..40%

Clamps—
Adjustable, Hammers' ..20@20&5%
Cabinet Sargent's ..50&10%
Carriage Makers', P., S. & W. Co. ..50%
Carriage Makers' Sargent's ..60%
Besly, Parallel ..33⅓&10%
Linemans, Duda Drop Forge & Tool Co ..40%
Saw Clamps, see *Vises, Saw Filers'.*

Cleaners Sidewalk—
Star Socket, All Steel ..₱ doz. $4.05 net
Star Shank, All Steel ..₱ doz. $3.24 net
W. & C. Snaar, All Steel, 7½ in. ₱ doz., $3.05; 8 in., $3.10; 8½ in., $3.25.

Cleavers, Butchers'—
Foster Bros. ..30%
New Haven Edge Tool Co.'s ..45%
Fayette R. Plumb ..33⅓@33⅓&10%
P., S. & W. ..50@50&5%
L. & I. J. White ..25%

Clippers—
Chicago Flexible Shaft Company
'98 Chicago Horse ..$8.75
1902 Chicago Horse ..$10.75
Lightning Belt ..$15.00
Chicago Belt ..$20.00
Stewart's Patent Sheep ..$18.50
} 15%

Clips, Axle—
Eagle and Superior ¼ and 5-16 inch ..70c&10%
Norway, ½ and 5-16 inch ..70@70c&10%

Cloth and Netting, Wire
—*See Wire, &c.*

Cocks, Brass—
Hardware list:
Compression and Plain Bibbs ..65c&5@65c&10%
Globe, Kerosene, Racking, &c., Cocks ..65c&10@70%

Coffee Mills—See *Mills, Coffee.*

Collars Dog—
Brass, Walter B. Stevens & Son's list ..40%
Embossed, Gilt, Walter B. Stevens & Son's list ..30&10%
Leather, Walter B. Stevens & Son's list ..40%

Combs Mane and Tail—
Covert's Saddlery Works ..60&10%

Compasses Dividers, &c.
Ordinary Goods ..75@75c&5%
Bemis & Call Hdw. & Tool Co.:
Dividers ..65%
Calipers, Call's Patent Inside ..55%
Calipers, Double ..65%
Calipers, Inside or Outside ..65%
Calipers, Wing ..60%
Compasses ..50%
J. Stevens A. & T. Co ..25&10%

Compressors Corn Shock—
J. B. Hughes ₱ doz ..$2.50

Conductor Pipe, Galva.—
L. C. L. to Dealers:

Territory.	*Not nested.*	*Nested.*
Eastern	75c&7½%	75c&2½%
Central	75c&2½%	70c&2½%
Southern	70c&7½%	70c&2½%
S. Western	65c&10%	65c&10c&5%

Terms, 2% for cash. With delivery on rail crates.
Jobbers receive extra 12½&2½ on carloads loose, and extra 12½ on carloads crated, and sometimes cut above prices.
See also *Eave Troughs.*

Coolers, Water—

Gal. each	2	3	4	6	8
Labrador	$1.20	$1.50	$1.80	$2.10	2.70
Gal.	3	4	5	6	8
Iceland, ea.	$1.80	$2.10	$2.40	$3.00	
Gal.	2	3	4	6	8
Galv. Lined Ea.	$1.85	$2.00	$2.25	$2.90	$3.90

35%

Ga.v. Lined side handles Gal.	2	3	4	6	8
Each	$1.95	$2.15	$2.40	$3.30	$4.15..25%

Coopers' Tools—
See *Tools, Coopers'.*

Cord—Sash—
Braided, Drab ..lb. 25c
Braided, White, Com ..lb. 17½@18c
Cable Laid Italian ..lb. *A*, 15c; *B*, 16c
Common India ..lb 9 @9½c
Cotton Sash Cord, Twisted ..12@16c
Patent Russia ..lb. 12½@13c
Cable Laid Russia ..lb. 13½@14c
India Hemp, Braided ..lb 14@15c
India Hemp, Twisted ..lb. 10@12c
Patent India, Twisted ..lb. 10@12c
Pearl Braided, cotton ..₱ lb 17½¢
Massachusetts, White ..₱ lb 22½¢
Massachusetts, Drab ..₱ lb 26½¢
Eddystone Braided Cotton ..₱ lb 14¢
Harmony Cable Laid Italian ..₱ lb 18¢
Ossawan Mills:
Crown, Solid Braided White ..₱ lb 22¢
Braided, Giant, White ..₱ lb 20¢
Peerless:
Cable Laid Italian ..16¢
Cable Laid Russian ..14¢
Cable Laid India ..12¢
Braided India ..18¢
Phœnix, White ..19¢
Samson, Nos. 7 to 12:
Braided, Drab Cotton ..₱ lb 32½¢
Braided, Italian Hemp ..₱ lb 32½¢
Braided, Linen ..₱ lb 49¢
Braided, White Cotton, Spot ..₱ lb 28½¢
No. 6 cocos, 1¢ extra.
Silver Lake:
A quality, Drab, 40¢ ..15%
A quality, White, 35¢ ..15%
B quality, Drab, 35¢ ..15%
B quality, White, 30¢ ..15%
Italian Hemp, 40¢ ..15%
Linen, 57½¢ ..15%

Wire, Picture—
List Oct., '00, 85c&10c&10@85c&10c&10c&10%
Note.—There is a good deal of confusion in lists, some using old list and others the above list.

Corn Knives and Cutters
—See *Knives, Corn.*

Corn Planters—
See *Planters, Corn—*

Crackers, Nut—
Little Giant ..₱ gr. $34.00

Cradles—
Grain ..50%

Crayons—
White Round Crayons, gross 5½@6c
Cases, 100 gro., $4.50, at factory.
D. M. Stewart Mfg. Co.
Metal Workers' Crayons, gr. $2.50
Soapstone Pencils, round, flat or square ..gr. $1.50
Rolling Mill Crayons ..gr. $2.50
Railroad Crayons (composition) gr. $2.00
} Case lots 20%

See also *Chalk.*

Creamery Pails—See *Pails, Creamery.*

Crooks, Shepherds'—
Fort Madison, Heavy ..₱ doz. $7.00
Fort Madison, Light ..₱ doz. $6.50

Crow Bars—See *Bars, Crow.*

Cultivators—
Victor Garden ..50%

Cutlery Table—
International Silver Company:
No. 12 Medium Knives, 1847 ..₱ doz. $3.50
Star, Eagle, Rogers & Hamilton and Anchor ..₱ doz. $3.00
Wm. Rogers & Son ..₱ doz. $2.50
Simeon L. & Geo. H. Rogers Company:
12 dwt. Medium Knives ..₱ doz. $3.00
No. 77 Medium Knives ..₱ doz. $2.50

Cutters—Glass—
H. H. Mayhew Co ..40%
Red Devil ..50%
Smith & Hemenway Co ..40%
Woodward ..40%

Meat and Food—
Hale's...Nos. 11 & 111 12 & 112 13 & 113
Per doz ..$8.00 10.75 15.50

American						30%
Nos	1	2	3	4	5	
Each	$5	$7	$10	$25	$50	$60
Connecticut						50%
Nos	20	40	60	8	10	12
Each	$1.75	2.00	2.75	3.00	3.00	4.00
Enterprise						25@25&7½%
Nos	5	10	12	22	32	
Each	$2	$3	$2.50	$4	$6	
Dixon's, ₱ doz						30&10@40%
Nos	1	2	3	4		
	$14.00	$17.00	$19.00	$30.00		
Home No. 1, ₱ doz						$22.50 ..50&10%
Little Giant, ₱ doz						..33⅓&5@40%
Nos.	305	310	312	320	322	
	$35.00	$48.00	$44.00	$73.00	$68.00	

N. E. Food Choppers ..40%
Sterling ..40% and 5%
No. 1 ..$2.00 each No. 2 ..$2.50 each
New Triumph No. 605, ₱ doz. $24.00 ..30&10@40%

Woodruff's, ₱ doz			..30&10@40%
Nos	100	150	
	$15.00	$18.00	

Chadborn's Smoked Beef Cutter, ₱ doz. $60.00
Enterprise Beef Shavers ..25@30%

Slaw and Kraut—
Henry Disston & Sons:
Slaw, Corn Grater, &c ..40%
Kraut Cutters 24 x 7, 26 x 8, 30 x 9 ..55%
Kraut Cutters 36 x 12, 40 x 12 ..40%
Sterling, $6.00 each ..33⅓%
Tucker & Dorsey Mfg. Co.:
Kraut Cutters ..40%
Slaw Cutters, 1 Knife, ₱ gr. ..$18@$20
Slaw Cutters, 2 Knife, ₱ gr. ..$23@$30

Tobacco—
All Iron, Cheap ..doz. $4.25@$4.50
Enterprise ..25&5%
National, ₱ doz. No. 1, $21; No. 2, $18 ..40%
Sargent's, ₱ doz., No. 2 ..60%
Sargent's No. 12 and 21 ..60&10%

Washer—
Appleton's, ₱ doz. $16.00 ..50&10%
Bonney's ..40%

Diggers, Post Hole, &c.—
Dalbey Post Hole Auger ..per doz. $9.00
Iwan's Improved Post Hole Auger ..40&5%
Iwan's Perfection Post Hole Digger ..₱ doz. $8.50
Kohler's Universal ..₱ doz. $15.00
Kohler's Little Giant ..₱ doz. $14.00
Kohler's Hercules ..₱ doz. $12.00
Kohler's Invincible ..₱ doz. $10.00
Kohler's Rival ..₱ doz. $9.00
Kohler's Pioneer ..₱ doz. $8.00
Never-Break Post Hole Diggers, ₱ doz. $24.00 ..60%
Samson, ₱ doz. $34.00 ..25%

Dividers—See *Compasses.*

Dog Collars—See *Collars, Dog.*

Door Checks—See *Checks, Door.*

Door Springs—See *Springs, Dr.*

Doors Screen—
Porter's Plain, No. 6 ..₱ doz. $6.50
Porter's Ornamental, No. 7 ..₱ doz. $10.00

Drawers, Money—
Tucker's Pat. Alarm, Till No. 1, ₱ doz. $18; No. 2, $15; No. 3, $12; No. 4, $18.

Drawing Knives—
See *Knives, Drawing.*

Drills and Drill Stocks—
Common Blacksmiths' Drill ..each $1.50@$1.75
Blacksmiths' Self-feeding ..$3.75@4.00
Breast, Millers Falls ..15c&10%
Breast, P., S. & W ..40&5%
Goodell Automatic Drills ..40&5@40&10%
Johnson's Automatic Drills Nos. 2 and 3 ..16⅔&10%
Johnson's Drill Points ..16⅔&5&10%
Millers Falls Automatic Drills ..33⅓&10%
Ratchet, Curtis & Curtis ..25%
Ratchet, Parker's ..40%
Ratchet, Weston's ..33⅓%
Ratchet, Whitney's, P. S. & W ..50%
Whitney's Hand Drill, No. 1, $10.00; Adjustable, No. 10, $12.00 ..33⅓%

Twist Drills—
Standard List ..60c&10@65c&10c&10%

Drill Bits or Bit Stock Drills—See *Augers and Bits.*

Drivers Screw—
Screw Driver Bits..per doz ..45@75c
Bailey's Screw Holder and Driver, ₱ doz. 2¼-inch, $6; 4-in., $7.50 6-in., $9 ..40%
Buck Bros ..30%
Buck Bros' Screw Driver Bits ..30%
Champion ..50%
Edson ..60%
Fray's Hol. H'dle Sets, No. 3, $12.00 ..50%
Gay's Double Action Ratchet ..35%
Goodell's Auto ..50&10&10@50&10&10&5%
Hurwood ..40%
Mayhew's Black Handle ..50%
Mayhew's Monarch ..40&10%
Millers Falls, Nos. 20 and 21 ..2%&10%
Millers Falls, Nos. 11, 12, 41, 42 ..15&10%
Never Turn ..60%
New England Specialty Co ..50%
Sargent & Co.'s:
Nos. 1, 50, 55 and 60 ..60%
Nos. 20 and 40 ..70%
Smith & Hemenway Co ..40&5%
Stanley's R. & L. Co.'s:
No. 64, Varnished Handles ..30&60&10&10%
No. 86 ..70@70&10&10%
Swan's:
Nos. 65 to 68 ..50%
No. 40 ..40&10%
Nos. 35, 35 and 45 ..20&10&10%

Eave Trough Galvanized

Territory.	*L. C. L.*	
Eastern	..80c&7½%	Carloads extra 12½&5
Central	..80c&2½%	
Southern	..75c&10c&5%	
S. Western	..75c&10c&2½%	

Terms, 2% for cash.
Prices sometimes cut by jobbers
See also *Conductor Pipe and Elbows.*

Elbows and Shoes—
Factory shipments ..60%
Perfect Elbows (S. S. & Co.) ..30%

Emery, Turkish—

	4 to 5½	5½ to 15	50 Flour
Kegs ..lb.	5c	5½c	3 c
½ *Kegs* ..lb.	5½c	5¾c	3½c
¼ Kegs ..lb.	5c	6c	

10-lb cans, 10 in case 6½ 7c 6c
10-lb. cans, less than 10 10c 8c
NOTE.—*In lots 1 to 3 tons a discount of 10% is given.*

Enameled and Tinned Ware—See *Ware, Hollow.*

Escutcheon Pins—
See *Pins, Escutcheon.*

Extractors, Lemon Juice
—See *Squeezers, Lemon.*

Fasteners, Blind—
Zimmerman's ..50&10%
Wells ..0%

Faucets—
Cork Lined ..50@50&10%
Metallic Key, Leather Lined ..70@70&10%
Red Cedar ..40c&10@50%
B. & L. B. Co.:
Oil Key ..60&10%
Star ..60%
West Lynn ..50&10%
John Sommer's Peerless Tin Key ..40%
John Sommer's Boss Tin Key ..50%
John Sommer's Victor Metal Key ..50&10%
John Sommer's Duplex Metal Key ..60%
John Sommer's Diamond Lock ..40%
John Sommer's I. X. L. Cork Lined ..50%
John Sommer's Reliable Cork Lined ..50&10%
John Sommer's Chicago Cork Lined ..60%
John Sommer's O. K. Cork Lined ..50%
John Sommer's No Brand, Cedar ..50%
John Sommer's Perfection Cedar ..40%
McKenna, Brass:
Burglar Proof, N. P ..35%
Improved, ¾ and ⅞ inch ..35%
Self Measuring:
Enterprise, ₱ doz. $66.00 ..40&10%
Lane's, ₱ doz. $36.00 ..40&10%
National Measuring, ₱ doz. $36 ..40&10%

Felloe Plates—
See *Plates, Felloe.*

Files—Domestic—
List revised Nov. 1, 1899.
Best Brands ..70c&5@70c&10%
Standard Brands ..75@75c&10c&5%
Second Quality ..75c&10c&10@80c&5%

Imported—
Stubs' Tapers, Stubs' list, July 21, '97 ..30%

Fixtures, Grindstone—
Net Prices:

Inch	15	17	19	21	24
Per doz	$2.60	2.75	3.00	3.50	4.40

P., S. & W. Co ..30&10@40%
Reading Hardware Co ..60%
Sargent's ..60&10&10%
Stowell's Giant Grindstone Hanger ..₱ doz. $6.00
Stowell's Grindstone Fixtures, Extra Heavy ..50&10&10%
Stowell's Grindstone Fixtures Light ..60&10%

Fodder Squeezers—
See *Compressors.*

Forks—*Aug. 1, 1899, list.*
Hay, 2 tine ..60%
Hay 3 tine ..60c&½%
Hay, 4 tine ..66⅔&5%
Hay, Header and Baler 3 tine ..60c&15%
Hay, Header and Baler, 4 tine ..66⅔%
Grain or Barley ..70%
Manure, 4 tine ..60&20%
Manure, 5 and 6 tine ..60&20%
Spading ..70c&5%
} Extra 50%

Iowa Dig-Em Potato ..65%
Victor, Hay ..66⅔%
Victor, Manure ..66⅔%
Victor, Header ..66⅔%
Champion, Hay ..66⅔%
Champion, Manure ..66⅔%
Columbia, Hay ..60&20%
Columbia, Manure ..66⅔&5%
Columbia, Spading ..70%
Hawkeye Wood Barley 4 tine ₱ doz. $5.00; 6 tine, $6.00 ..70&10%
W. & C. Potato Digger ..65%
Acme Hay ..60&10&7½%
Acme Manure, 4 tine ..60&20&10%
Acme Manure, 6 tine ..66⅔&10&2½%
Dakota Header ..65&15&5%
Jackson Steel Barley ..65&15&5%
Kansas Header ..66⅔%
W. & C. Favorite Wood Barley 4 tine, ₱ doz., $5.00; 6 tine, $6.00 ..65%
Plated.—See *Spoons.*

Frames—Saw—
Red, Polished and Varnished ..doz. $1.15@$1.50
White ..doz. 75@90c

Screens and Frames—
See *Screens.*

Freezers, Ice Cream—

Qts	2	3	4	6	8	10
Best	$1.45	1.65	1.95	2.40	3.20	4.20
Good	$1.25	1.40	1.70	2.15	2.75	3.75
Fair	$1.00	1.10	1.30	1.75	2.30	2.90

Fruit and Jelly Presses—
See *Presses, Fruit and Jelly.*

Fry Pans—See *Pans, Fry.*

Fuse—
Per 1000 Feet.

Temp Fuse	$2.60
Cotton Fuse	2.90
Single Taped Fuse	3.25
Double Taped Fuse	4.20
Triple Taped Fuse	5.00

} 10&2½%

Gates, Molasses and Oil—

Stebbins' ..... 80@80&5%

Gauges—

Marking, Mortise, &c. ..... *55&10@55&10@10%*

Chapin-Stephens Co., Gauges ..... 5 &10@50&10&10%

Fulton's Butt Gauge ..... 30&10%

Stanley R. & L. Co.'s Butt & Babbet Gauge ..... 40@20&10&10%

Wire, Brown & Sharpe's 25%

Wire, Morse's 25%

Wire P., S. & W. Co ..... 30&10%

Gimlets— Single Cut—

Nail, Metal, Assorted gro. $1.40@1.60

Spike, Metal, Assorted gro. $2.80@3.25

Nail, Wood Handled, Assorted. gro. $1.75@2.00

Spike, Wood Handled, Assorted gro. $3.25@3.50

Glass, American Window

Jobbers' List, Dec. 16, 1902.

From store. Single and Double 90&10%

F. O. B. factory, carload lots:

Single and Double strength ..... *90&20&2½%*

Glasses Level—

Chapin-Stephens Co. ..... 60@60&10&10%

Glue—Liquid, Fish—

List A, Bottles or Cans, with Brush. *37½@50%*

List B, Cans (½ pts., pts., qts) 33 @48%

List C. Cans (½ gal., gal.) ..... *25@45%*

International Glue Co. (Martin's) ..... 40&10@5%

Grease, Axle—

Common Grade ..... *gro. $5.00@6.00*

Dixon's Everlasting ..... 10-lb pails, ea. 85¢

Dixon's Everlasting, in bxs.. ₱ doz. 1 lb $1.20; 2 lb $2.00

Snow Flake: 1 qt. cans, per doz. $2.00; 2 qt., $3.30; 1 gal. cans per doz. $6.00; 5 gal. $16.00; 5 gal. $24.00 } 10%

Griddles, Soapstone—

Pike Mfg. Co. ..... 33⅓@33⅓&10%

Grindstones—

Bicycle Emery Grinder $6.50

Bicycle Grindstones, each ..... $2.50@3.00

Pike Mfg. Co.: Improved Family Grindstones, per inch, per doz. ..... $2.00 } 33⅓%

Pike Mowe: Knife and Tool Grinder, each ..... $6.00 }

Velox Ball Bearing, mounted, Angle Iron Frames ..... each, $3.25

Guards Snow—

Cleveland Wire Sp ing Co.:

Galv. Steel ₱ 1000 ..... $9.00

Copper ₱ 1000 ..... $18.00

Halters and Ties—

Covert Mfg. Co.:

Web ..... 45&2%

Jute Rope ..... 45&2%

Sisal Rope ..... 30&2%

Covert's Saddlery Works:

Web and Leather Halters 70%

Jute and Manila Rope Halters 70%

Sisal Rope Halters ..... 60&20%

Jute, Manila and Cotton Rope Ties 70%

Sisal Rope Ties ..... 60&10%

Hammers—

Handled Hammers—

Heller's Machinists' ..... 40&10@40&10&10%

Heller's Farriers ..... 40&10@40&10&10%

Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50, $1.75 ..... 40@40&.0&10%

Peck, Stow & Wilcox 50%

Fayette R. Plumb:

Plumb, A. E. Nail. 33⅓&7½@33⅓&1⅓ &7½&5%

Engineers' and B. S. Hand ..... 50&5&5@50&10&7½&5%

Machinists' Hammers 50&5@50&10&5%

Riveting and Tinners' ..... 40&2½@40&10&2½%

Sargent's C. S. New List 40%

Heavy Hammers and Sledges—

3 lb. and under ... lb. 45c
3 to 5 lb ..... lb. 36c } *75&5@75&10%*
Over 5 lb ..... lb. 30c

Wilkinson's Smiths' ..... 9½c@10c lb.

Handles—

Agricultural Tool Handles—

Axe, Pick, &c. ..... 50@50&10@5%

Hoe, Rake, &c. ..... 60@60&5%

Fork, Shovel, Spade, &c.:

Long Handles 60%

D Handles 50%

Cross-Cut Saw Handles—

Atkins' ..... 40&5%

Champion ..... 45@45&10%

Disston' 50%

Mechanics' Tool Handles—

Auger, assorted ..... gro. $2.30@$2.50

Brad Awl ..... gro. $1.25@$1.50

Chisel Handles:

Apple Tanged Firmer, gro. ass'd. $2.25@$2.35; large, $2.50@$2.60.

Hickory Tanged Firmer, gro. ass'd. $1.75@$2.20; large, $3.50@$3.70.

Apple Socket Firmer, gro. ass'd, $1.70@$1.85; large, $2.00@$2.25

Hickory Socket Firmer, gro. ass'd, $1.60 @ $1.75; large, $1.75 @ $2.00

Hickory Socket Framing, gro. ass'd. $2.50@$2.75; large, $2.65@$2.85

File, assorted ..... gro. $1.00@$1.15

Hammer, Hatchet, Axe, &c. 5%

Hand Saw, Varnished, doz. 70@75c

Not Varnished ..... 55@60c

Plane Handles:

Jack, doz. 25c; Jack Bolted .. 55@60c

Fore, doz. 35@38c; Fore, Bolted .. 70@75c

Chapin-Stephens Co.:

Carving Tool ..... 40@4 &10&10%

Chisel ..... 65@65&10%

File and Awl ..... 65 @35&10%

Saw ..... 40@40&10&10%

Screw Driver ..... 40@40&10&10%

Millers Falls Adj. and Ratchet Auger Handles ..... 15&10%

Nicholson Simplicity File Handle, ₱ gro. ..... $0.85@$1.50

Hangers—

Barn Door, New Pattern, Round Groove, Regular:

Inch	*3*	*4*	*5*	*6*	*8*
Single Doz.	*$0.85*	*1.20*	*1.50*	*1.90*	*2.50*

Barn Door, New England Pattern, Check Back, Regular:

Inch	*3*	*4*	*5*	*6*
Single Doz.	*$1.10*	*1.50*	*2.15*	*2.70*

Allith Mfg. Co.

Reliable ..... per doz. $15.00

Chicago Spring Butt Co.:

Friction 25%

Oscillating 25%

Big Twin 25%

Chisholm & Moore Mfg. Co.:

Baggage Car Door 50%

Elevator 40%

Railroad 55%

Cronk & Carrier Mfg. Co.:

Loose Axle 60%

Roller Bearing ..... 60&10%

Lane Bros. Co.:

Parlor, Ball Bearing $4.15

Parlor, Standard $3.35

Parlor, New Model $2.85

Parlor New Champion $2.25

Barn Door, Standard 50&10&10&5%

Covered ..... 50&10&10%

Special ..... 50&10&10&5%

Lawrence Bros.:

Advance 60%

Cleveland ..... 60&10%

Crown 60%

Giant ..... 50&10%

New York 60%

Peerless ..... 60&10%

Sterling 60%

Swing, No. 95 ..... 50&10%

Union, No. 44, $5.00; No. 45 $7.00; No. 46, $9.00.

McKinney Mfg. Co.:

No. 1, Special, $15 ..... 60&10%

No. 2, Standard, $18 ..... 60&10%

Hinged Hangers, $16 ..... 50%

Meyers' Stayon Hangers 50&10% (net)

C. S. Smith Mfg. Co.:

Lundy Parlor Door 50%

Monarch Barn Door 60%

Never Jump Hinge 50%

Peerless 60%

Perfection ..... 60&10%

Phœnix ..... 60&10%

Wagner's Adjustable ..... 60&10%

Warehouse Anti-Friction 60%

Stowell Mfg. and Foundry Co.:

Acme Parlor Ball Bearing 40%

Atlas 60%

Badger Barn Door 50%

Baggage Car Door 50%

Climax Anti-Friction 50%

Elevator 40%

Express 50%

Interstate 60%

Lundy Parlor Door 50%

Magic 50%

Matchless 60%

Nansen ..... 60&10%

Railroad 50%

Street Car Door 50%

Steel, Nos. 300, 401, 500 ..... 40&15%

Stowell Parlor Door 50%

Wild West, Nos. 301, 401, 501 ..... 5%

Zenith for Wood Track 50%

A. L. Swett Iron Works:

Eagle ..... 60&10%

Hylo ..... 50& 0%

Perfection 60%

Pilot 3%

Taylor & Boggis Fy Co. 50&15&10&5%

Wilcox Mfg. Co.:

Bike Roller Bearing ..... 60&10%

C. J. Roller Bearing ..... 60&10%

Cycle Ball Bearing 50%

Dwarf Ball Bearing 40%

Ives, Wood Track ..... 60&10%

L. T. Roller Bearing ..... 60&10&5%

New Era Roller Bearing ..... 50&10%

O. K. Roller Bearing ..... 60&10&5%

Prindle, Wood Track 60%

Richards' Wood Track 60%

Richards' Steel Track ..... 50&10%

Spencer Roller Bearing ..... 6 &10%

Tandem Nos. 1 and 2 ..... 60%

Underwriters' Roller Bearing 40%

Velvet 50%

Wilcox Auditorium Ball Bearing 20%

Wilcox Barn Trolley No. 125 ..... 40%

Wilcox Elevator Door Hangers, Nos 112 and 122½ 50%

Wilcox Elevator Door Hangers, No. 132 ..... 40%

Wilcox Fire Trolley, Roller Bearing 30%

Wilcox Le Roy Noiseless Ball Bearing 40%

Wilcox New Century ..... 50&10&10%

Wilcox O. K. Steel Track 50%

Wilcox O. K. Trolley 50%

Wilcox Trolley Ball Bearing 40%

Wilcox Wideman Narrow Gauge Ball Bearing 40%

For Track, see *Rail.*

Extra 5&10% often given.

Hasps—

McKinney's Perfect Hasp ₱ doz. 50%

Wrought Hasps, Staples, &c.—See *Wrought Goods.*

Hatchets—

Best Brands ..... *50@50&10%*

Cheaper Brands ..... *60@60&10%*

Note.—Net prices often made.

Hinges—

Blind and Shutter Hinges—

Surface Gravity Locking Blind: (Victor; National; 1888 O. P. Niagara; Clark's O. P.; Clark's Tip; Buffalo.)

No.	*1*	*3*	*5*
Doz pair	*$0.55*	*1.75*	*3.50*

Mortise Shutter: (L. & P., O. S., Dixie, &c.)

No.	*1*	*1½*	*2*	*2½*
Doz. pair	*$0.70*	*.65*	*.60*	*.55*

Mortise Reversible Shutter, (Buffalo, &c.)

No.	*1*	*1½*	*2*
Doz. pair	*$0.75*	*.70*	*.65*

North's Automatic Blind Fixtures, No. 2, for Wood, $9.00; No. 3, for Brick, $11.50 ..... 10%

Parker ..... 70@75%

Reading's Gravity ..... 75&10%

Sargent's, Nos. 1, 3, 5, 11 & 13 ..... 70&10@70&20%

Stanley's Steel Gravity Blind Hinges, ₱ doz. sets, without screws, $0.80; with screws, $1.15.

Wrightsville H'dware Co.:

O. S., Lull & Porter ..... 75&5%

Acme, Lull & Porter 75%

Queen City Reversible 75%

Stenger's Positive Locking, Nos. 1 & 3 ..... 70&10%

Shepard's Noiseless, Nos. 60, 65, 55 ..... 70&10%

Niagara, Gravity Locking, Nos. 1, 3 & 5 ..... 75%

1888, Old Pat'n, Nos. 1, 3 & 5 ..... 75%

Tip Pat'n, Nos. 1, 3 & 5 ..... 75%

Buffalo Gravity Locking, Nos. 1, 3 & 5 ..... 75%

Shepard's Double Locking, Nos. 20 & 25 ..... 70%

Champion Gravity Locking, No. 75 ..75%

Steamboat Gravity Locking, No. 10. 75%

Pioneer, Nos. 100, 45 & 5½ 75%

Empire, Nos. 101 & 103 ..... 70%

W. H. Co.'s Mortise Gravity Locking, No. 2 ..... 60%

Gate Hinges—

Clark's or Shepard's—Doz. sets:

No.	*1*	*2*	*3*
Hinges with Latches	*$2.00*	*2.70*	*5.00*
Hinges only	*$1.40*	*2.05*	*3.80*
Latches only	*.70*	*.70*	*.35*

New England:

With Latch ..... doz. ....@$2.50

Without Latch .... doz. ....@$1.80

Reversible Self-Closing:

With Latch ..... doz. ....@$1.80

Without Latch ..... doz. ....@$1.45

Western:

With Latch ..... doz. $1.80

Without Latch ..... doz. $1.20

Wrightsville H'dware Co.:

Shepard's or Clark's, doz. sets,

No.	1	2	3
Hinges with Latches	$2.00	2.70	5.00
Hinges only	1.40	2.05	3.80
Latches only	.70	.70	1.35

Spring Hinges—

Holdback, Cast Iron ..gro. $9.50@10.00

Non-Holdback, Cast Iron gro $7@7.50

J. Bardsley

Bardsley's Patent Checking 15%

Bommer Bros.:

Bommer Ball Bring Floor Hinges 10%

Bommer Spring Hinges 40%

Chicago Spring Butt Co.:

Chicago Spring Hinges 25%

Triple End Spring Hinges 50%

Chicago (Ball Bearing) Floor Hinge 45%

Garden City Engine House 25%

Keen's Saloon Door 25%

Columbian Hdw. Co.:

Acme, Wrt. Steel 30%

Acme, Brass ..... 20&1%

American 30%

Columbia, No. 14 ..... ₱ gr. $9.00

Columbia, No. 18 ..... ₱ gr. $25.00

Columbia, Adjustable, No. 7, ₱ gr. $12.00

Gem, new list 30%

Clover Leaf ..... ₱ gr. $12.50

Hoffman Hinge & Foundry Co.:

No. 70 & 81 Holdback Detachable $8.50

Lawson Mfg. Co.:

Matchless 35%

Matchless Pivot 45%

Payson Mfg. Co.:

Oblique ..... 50&10%

Shelby Spring Hinge Co.:

Crown Jamb Hinge 40%

Chief Ball Bearing Floor Hinge 45%

Royal Ball Bearing Floor Hinge 45%

The Stover Mfg. Co.:

Ideal, No. 16, Detachable, ₱ gr $12.50

Ideal, No. 4 ..... ₱ gr. $9.00

New Idea No. 1 ..... ₱ gr. $9.00

New Idea, Double Acting 45%

Extra 5&10% often given on most of these Hinges.

Wrought Iron Hinges—

Strap and T Hinges, &c., list Mar. 15, 1901:

Light Strap Hinges 70%

Heavy Strap Hinges .. 75&10%

Light T Hinges 65%

Heavy T Hinges ..... 60&5%

Extra Heavy T Hinges 55%

Hinge Hasps 55%

Cor. Heavy Strap ..... 75&10%

Cor. Ex. Heavy T 75%

Screw Hook and Strap. 6 to 12 in ..... lb. 3½c
14 to 20 in ..... lb. 3¼c
22 to 36 in ..... lb. 3 c

Screw Hook and Eye:

¾ to 1 inch ..... lb. 5 c

⅝-inch ..... lb. 6 c

½-inch ..... lb. 7 c

Extra 5&10% and 10&10%

Miscellaneous—

Hoffman's Steel Spring Butt Hinges ..... 40&10%

Hoffman's Offset Refrigerator Hinges ..... 40&10%

Hods Coal—

	15	*16*	*17*	*18 inch.*
Galv. Open	*$2.50*	*2.75*	*3.00*	*3.25 ₱ doz.*
Jap. Open	*$2.00*	*2.25*	*2.50*	*2.75 ₱ doz.*
Galv. Funnel	*$3.00*	*3.25*	*3.50*	*3.75 ₱ doz.*
Jap. Funnel	*$2.50*	*2.75*	*3.00*	*3.25 ₱ doz.*

Extra 20¢ ₱ doz.

Masons, Etc.—

Hoffman's:

Brick ..... each $1.10

Mason's ..... each $3.00

Plasterers' ..... each $3.20

Hoes— Eye—

Scovil and Oval Pattern ..... *60&10@60&10&10%*

Grub, list Feb. 23, 1899 .... *70@70&10%*

D. & H. Scovil 35%

Handled—

Aug. 1, 1899, List:

Garden ..... 70&10%

Meadow & Rhode Island 75&2½%

Southern Meadow .. 75&5&2½%

Mortar and Street .... 75&7½%

Planters', Regular Pat'n. 70&30%

Cotton ..... 75&7½%

Toy, Ladies', Boys', Onion, Turnip, Berry or Tobacco. 70&10&5%

Extra 20%

Note.—Manufacturers and jobbers use a diversity of lists, and often sell at net prices.

Ft. Madison Cotton Hoe ..... 75&7½%

Ft. Madison Crescent Cultivator Hoe, per doz ..... 75&10%

Ft. Madison Mattock Hoes:

Regular Weight .. ₱ doz. $5.00

Junior Size ..... ₱ doz. $4.00

Ft. Madison Sprouting Hoe, ₱ doz. $4.80

Ft. Madison Dixie Tobacco Hoe. 75&20%

Kretsinger's Cut Easy ..... 70&10%

Warren Hoe 60%

W. & C. Ivanhoe ..... 75&2%

B. B. Cultivator Hoe ..... 75&10&2%

Acme Weeding ..... 75&10&2%

W. & C. Lightning Shuffle Hoe, ₱ doz. $4.85

Hog Rings and Ringers—

See *Rings and Ringers.*

Hoisting Apparatus—

See *Machines, Hoisting.*

Hollow Ware—

See *Ware, Hollow.*

Holders— Bit—

Angular, ₱ doz. $24.00 ..... 45&10%

Door—

Empire 50%

File and Tool—

Nicholson File Holders and File Handles 38½%

Hooks— Cast Iron—

Bird Cage, Reading 60%

Bird Cage, Sargent's List 60%

Ceiling, Sargent's List ..... 40&10%

Clothes Line, Hoffman's ..... 40&10%

Clothes Line, Reading List ..... 65&10@65&10&10%

Clothes Line, Sargent's List. 50&20&10%

Coat and Hat, Sargent's List ..... 45&10%

Clothes Line, Stowell's 70%

Coat and Hat, Stowell's 70%

Coat and Hat, Reading ..... 70@75%

Coat and Hat, Wrightsville 65%

Harness, Hoffman ..... per doz. 35@40¢

Harness, Reading List ..... 70&10@75%

Wire—

Belt *80%*

Wire C. & H. Hooks .. 60&10@60&10&5%

Atlas, Coat and Hat:

Single Cases 5%

10 Case Lots ..... 50&10%

Czar Harness ..... 50&10&5%

Wire Coat and Hat:

Acme 60%

B. B 60%

V Brace, Chief and Czar 60%

Gem 60%

Bright Wire Goods—See *Wire.*

Wrought Iron—

Box, 6 in., per doz, $1.00; 8 in., $1.25; 10 in., $2.50.

Cotton ..... doz. $1.05@1.25

Wrought Staples, Hooks, &c.—See *Wrought Goods.*

Miscellaneous—

Bush, Light, doz. $5.50; Medium, $6.00; Heavy, $6.50

Grass ..... Nos.	*1*	*2*	*3*	*4*
Best	*$1.50*	*1.75*	*2.00*	
Common	*$1.30*	*1.30*	*1.50*	*1.60*

Potato and Manure ..... 66⅔&20%

Whiffletree ..... lb. 5½c

Hooks and Eyes:

Brass ..... 60&10&10@70%

Malleable Iron ..... 70&5@70&10%

Covert Saddlery Works' Self Locking Gate and Door Hook 60%

Ft. Madison Cut-Easy Corn Hooks, ₱ doz. $5.35 net

Crown Picture ..... 50&10%

Bench Hooks—See *Bench Stops.*

Corn Hooks—See *Knives, Corn.*

Horse Nails—See *Nails, Horse*

Horseshoes—

See *Shoes, Horse.*

Hose Rubber—

Garden Hose, ¾-inch:

Competition ..... ft.	*4¼@*	*4¼c*
3-ply Standard ..... ft.	*6 @*	*6½c*
4-ply Standard ..... ft.	*7½@*	*8 c*
5-ply extra ..... ft.	*8½@*	*9 c*
4-ply extra ..... ft.	*10½@*	*11 c*

Cotton Garden, ¾-in., coupled:

Low Grade ..... ft. 6	*@7*	*c*
Fair quality ..... ft. 8	*@9*	*c*

Irons— Sad—

From 4 to 10 ..... lb 2¾@3c

B. B. Sad Irons ..... lb. 3@3½c

Chinese Laundry ..... lb. 4½@5c

Chinese Sad ..... lb. 3¾@4c

Mrs. Potts', per set:

Nos	*50*	*55*	*60*	*65*
Jap'd Tops	*71c*	*71c*	*81c*	*81c*
Tin'd Tops	*77c*	*74c*	*87c*	*84c*

New England Pressing, lb.. 3½@3¾c

Pinking—

Pinking Irons ..... doz. 50@60c

Soldering—

Soldering Copper ..... 18@19

2 lb., and up ..... 20@21c

Covert Mfg. Co ..... 20&2%

Jack Screws—See *Screws.*

Jacks, Wagon—

Covert Mfg. Co., Steel ..... 45&2%

Covert's Saddlery Works':

Daisy ..... 60&10%

Victor ..... 60&10%

Lockport 50%

Lane's Steel ..... 30&10%

Kettles—

Brass, Spun, Plain ..... 20@25%

Enameled and Cast Iron—See *Ware, Hollow.*

Knife Sharpeners—

See *Sharpeners, Knife.*

Knives—

Butcher, Kitchen, &c.—

Foster Bros.' Butcher, &c. 30%

Hartzell Cutlery Co. 50%

Smith & Hemenway Co ..... 40&10%

Hay and Straw—See *Hay Knives.*

Corn—

Withington Acme, ₱ doz., $2.65; Dent, $2.75; Adj. Serrated, $2.20; Serrated, $2.10; Yankee No. 1, $1.50; Yankee No. 2, $1.15.

Drawing—

Standard List ..... 70&5@70&10%

Adjustable Handle ..... ₱ doz.

Bradley's ..... "

C. E. Jennings & Co. Nos. 45, 46.. 60&10%

Jennings & Griffin. Nos. 51, 52, 60 &10&10%

Swan's ..... 70&10&2½%

Watrous ..... 16⅔&10%

L. & I. J. White ..... 20&5@25%

Hay and Straw—

Lightning ..... per doz $5.00@5.25

Iwan's Sickle Edge ..... ₱ doz. $10.50

Iwan's Serrated ..... ₱ doz $10.00

Maine ..... ₱ doz $8.50

Mincing—
Buffalo, ₱ gro. $13.00

Miscellaneous—
Farriers' ..... *doz. $2.00@3.00*
Wostenholm's ..... ₱ doz. $3.00@3.25

Knobs—
Base, 2¼-inch, Birch, or Maple, Rubber tip, gro ..... *$1.10@1.20*
Carriage, Jap, all sizes..gro. 25@50c
Door, Mineral ..... *doz. 65@70c*
Door, Por. Jap'd ..... *doz. 70@75c*
Door, Por. Nickel...doz. $2.05@2.15
Bardsley's Wood Door, Shutter, &c ..15%
Picture, Sargent's ..... 60&10%

Lacing Leather—
See *Belting Leather—*

Ladders Step Etc.—
Goshen Mfg. Co.'s Step, etc. 50%
Lane's Store 25%
Myers' Noiseless Store Ladders 50%

Ladies— Melting—
L. & J. Mf'g. Co 25%
P. S. & W 50%
Reading 65%
Sargent's ..... 45&10%

Lanterns— Tubular—
Regular Tuoular ..... *doz. $4.35@4.75*
Lift Tubular ..... *doz. $4.75@5.25*
Hinge Tubular ..... *doz. $4.75@5.25*
Other Styles ..... *40@10@40@10@5%*

Bull's Eye Police—
No. 1, 2¼ inch ..... *$2.50@2.75*
No. 2, 3 inch ..... *$2.75@3.00*

Latches— Gate—
Hoffman's safety Gate ..... ₱ doz. 60c

Thumb—
Roggin's Latches, w. thscrew. dz35@40c

Lawn Mowers—
See *Mowers, Lawn.*

Leaders Cattle—
Small ..... *doz. 55c; large, 60c*
Covert Mfg. Co ....45&2%

Lemon Squeezers—
See *Squeezers, Lemon.*

Lifters, Transom—
Solid Grip, Payson Mfg. Co 80%
R. & E. 33⅓%

Lines—

Wire Clothes, Nos...	*18*	*19*	*20*
100 feet	*$2.20*	*2.00*	*1.65*
75 feet	*$1.80*	*1.70*	*1.30*

Oswawan Mills,
Crown Solid Braided Chalk 33⅓%
Mason's, No. 0 to No. 5 ..... 33⅓%
Samson Cordage Works:
Solid Braided Chalk, No. 0 to 3 ..... 40%
Silver Lake Braided Chalk, No. 0, $6.00;
No. 1, $6.50; No. 2, $7.00; No. 3, $7.50
₱ gr. 30%

Locks— Cabinet—
Cabinet Locks ..... *33⅓@33⅓&2½%*

Door Locks, Latches, &c.—
[Net prices are very often made on these goods.]
Reading Hardware Co 50%
R. & E. Mfg. Co 40%
Sargent & Co ..... 40@40&10%

Elevator—
Stowell's 40%

Padlocks—
Wrought Iron ..... *75@10@5@80@5%*
R. & E. Mfg. Co. Wrt. Steel and Brass... 75@75&10%

Sash, &c.—
Fitch's:
Bronze and Brass ..... 60&5%
Iron 70%
Ives' Patent.:
Bronze and Brass ..... 55&7½%
Iron ..... 60&2½%
Wrought Bronze and Brass ..... 50&5%
Wrought Steel 55%
Payson's Signal 80%
Reading ..... 60&10&10@70%

Machines— Boring—
Com., Upright, Without Augers..$2.00
Com., Angular, Without Augers..$2.25

	Without Augers.
R. & E. Mfg. Co.:	Upright. Angular.
Improved No. 3.	$4.25 $5.00
Improved No. 4.	3.75 3.38
Improved No. 5.	2.75
Jennings'.. No. 4,	3.15 No. 1, 3.50
Millers' Falls	5.75
Snell's, Rice's Pat.	2.50 2.75

Hoisting—
Moore's Anti-Friction Differential Pulley Block 30%
Moore's Hand Hoist, with Lock Brake. 20%
Moore's Portable Pneumatic Hoist.. 25%

Ice Cutting—
Chandler's ..... 15&10%

Washing—
Wayne American ..... ₱ doz. $28.00
Western Star, No. 2 ..... ₱ doz. 28.00
Western Star, No. 3 ..... ₱ doz. 30.00
St. Louis, No. 41 ..... ₱ doz. 60.00

Mallets—
Hickory ..... *45&5@50%*
Lignumvitæ ..... *45&5@50%*
Tinners', Hickory and Applewood, doz ..... *50@55c*

Mats— Door—
Elastic Steel (W. G. Co.) 10%

Mattocks—
See *Picks and Mattocks.*

Meat Cutters—
See *Cutters, Meat.*

Menders, Hose,
Robinson's Hose Menders ..... ₱ gro, $2.00

Milk Cans—See *Cans. Milk*

Mills— Coffee, etc.—
Enterprise Mfg. Co ..... 25@30%
Hoffman's Side, Coffee and Spice ..... ₱ doz. $1.25
National, list Jan. 1, '94 ..... 30%
Parker's Columbia & Victoria. 50&10&60%
Parker's Box and Side ..... 50&10@60%
Swift, Lane Bros Co 30%

Mincing Knives—
See *Knives, Mincing.*

Molasses Gates—
See *Gates. Molasses.*

Money Drawers—
See *Drawers, Money.*

Mowers Lawn—
Net prices are generally quoted.
Cheap ..... *all sizes. $1.90@1.95*
Good ..... *all sizes, $2.25@2.50*

	10	12	14	16-inch
High Grade	*4.25*	*4.50*	*4.75*	*5.00*
Continental	60&10%			
Great American	70%			
Great American Ball Bearing	60&10%			
Quaker City	70%			
Pennsylvania	60&10%			
Pennsylvania Ball Bearing	60&5%			
Pennsylvania Golf	50%			
Pennsylvania Horse	40%			
Pennsylvania Pony	45%			

Philadelphia:

Styles M., S., C., K., T.	70&5%
Style A, all Steel	60&10%
Style E, Low Wheel	60&10%
Style E, High Wheel	70&10&5%
Drexel and Gold Coin, low list	50&5%

Nails—
Cut and Wire. See Trade Report.
Wire Nails and Brads, Papered. List July 20, 1899 ..... *85@10@10@85@10&10@10d 10%*
Hungarian, Finishing, Upholsters', &c. See Tacks.

Horse—

Nos.	6	7	8	9	10	
A. C.	25¢	23¢	22¢	21¢	21¢	40&5%
Ausable	28¢	28¢	25¢	24¢	23¢	50&10%
C. B. K.	25¢	25¢	22¢	21¢	21¢	40%
Champ'n	28¢	26¢	25¢	24¢	23¢	40&10&5%
Clinton	19¢	17¢	16¢	15¢	14¢	30&10&5%
Maud S.	25¢	23¢	22¢	21¢	21¢	50%
Putnam	23¢	21¢	20¢	19¢	18¢	33⅓%

Putnam

Coll Rol'd	19¢ 18¢ 17¢ 16¢ ..... 10&10%
Vulcan	...23¢ 21¢ 20¢ 19¢ 18¢ ..25&10%
American, Nos. 5 to 10	₱ b ..... 9@9½¢
Neponset	Nos. 5 to 10¢ ₱ b 12¢
Jobbers' special brands..per lb. 8@9c	

Picture

	1½	2	2½	3	3½ in.
Brass Head.	*.45*	*.60*	*.70*	*.95*	*1.00 gro.*
Por. Head	*1.10*	*1.10*	*1.10*	..	*gro.*

Crown Picture Nails ..... ₱ gro. $1.50

Needles Tobacco
Nunley's Tin Tobacco ..... ₱ doz $2.00

Nippers, See *Pliers and Nippers.*

Nut Crackers—
See *Crackers, Nut.*

Nuts—
Cold Punched; Mfrs. or U. S. Standard. *Off list.*
Square, plain *$4.50*
Hexagon, plain *$4.60*
Square, C. T. & R. *$4.70*
Hexagon, C. T. & R. *$5.00*
Hot Pressed: Mfrs., U. S. or Nar. Gauge Stan'd.
Square Blank *$5.00*
Hexagon Blank *$5.20*
Square Tapped *$4.80*
Hexagon Tapped *$5.00*

Oakum—
Best or Government ..... *lb. 6¼c*
Navy ..... *lb. 5 c*
U. S. Navy ..... *lb. 5¼c*
Plumbers' Spun Oakum *2¾c*
In carload lots ¼c lb. off f.o b. New York.

Oil Axle—
Snow Flake:

1 pt. cans, per doz	$3.00
1 qt. cans, per doz	$4.80
1 gal. cans, per doz	$15 00
5 gal. cans, per doz	$66.00

33⅓&10%

Oil Tanks—See *Tanks, Oil.*

Oilers—
Brass and Copper ..... *65@65&10%*
Tin or Steel ..... *70@10@75%*
Zinc ..... *75@75&5%*
Chase or Paragon:
Brass and Copper ..... *65@5@65@10%*
Tin or Steel ..... *75@75@10%*
Zinc ..... *70@70@10%*
Malleable, Hammers' Improved, No. 1, $3.60; No. 2, $4; No. 3, $4.40 ₱ doz. 20%
Malleable, Hammers' Old Pattern, same list ..... 50&10%
Ame 1 n Tool & Stamping Co.:
Spring Bottom Cans ..... 70@70&10%
Railroad Oilers etc, ... 60@60&10%

Openers— Can—
French ..... *doz. 35c*
Iron Handle ..... *doz. 25@27c*
Sprague, Iron Hdle..per doz 35@40c
Sardine Scissors...doz. $1.75@3.00
Tip Top ..... per doz. $0.75
National 50%
Stowell's ..... per doz. 35@45c

Egg—
Nickel Plate ..... per doz., $2.25
Silver Plate ..... per doz., $3.50

Packing—
Asbestos Packing, Wick and Rope, 15@15½c lb.

Rubber—
Sheet, C. I. ..... *8@12c*
Sheet, C. O. S. ..... *9@13c*
Sheet, C. B. S. ..... *10@11c*
Sheet, Pure Gum ..... *50@70c*
Sheet, Red ..... *35@40c*
Jenkins' Standard, ₱ b 80¢ ..25@25&5%

Miscellaneous—
American Packing ..... *7@10c lb.*
Cotton Packing ..... *13@14c lb.*
Italian Packing ..... *8@12½c lb.*
Jute ..... *3½@4c lb.*
Russia Packing ..... *7@11c lb.*

Pails— Creamery
S. S. & Co., with gauges.. No 1 $6.25; No. 2, $5.50 ₱ doz.

Galvanized—
Price per doz.

	Quart	*10*	*12*	*14*
Water, Regular	..	*1.75*	*2.00*	*2.25*
Water, Heavy	....	*2.75*	*3.00*	*3.25*
Fire, Rd. Bottom	..	*2.30*	*2.60*	*2.80*
Well	.....	*2.25*	*2.50*	*2.75*

Pans— Dripping—
Standard List ..... *60@60@5%*

Fry—
Common Lipped:

No.	*1*	*2*	*3*	*4*	*5*
Per doz.	*$0.95*	*1.05*	*1.15*	*1.30*	*1.65*

Roasting and Baking—
Rezal, S. S. & Co., ₱ doz., Nos. 5, $4.50; 10 $5.25; 20 $5.75; 30, $6.25.
Simplex, ₱ doz.:

No.	40	50	60	140	150	160
	$2.75	3.25	3.75	3.00	3.25	4.00

Paper—Building Paper—

Asbestos:	*lb.*
Building Felt	*2¾c*
Mill Board, sheet, 40 x 40 inches	*3½c*
Mill Board, roll, thicker than 1-16 inch	*3¼c*
Mill Board, roll, 1-16 in. thick and less	*2½c*
	Per roll
Rosin Sized Sheathing:	*500 sq. ft.*
Light wt. 25 lbs. to roll	*$0.35@0.37*
Medium wt. 30 lbs. to roll	*$0.42@0.45*
Heavy wt. 40 lbs. to roll	*$0.50@0.60*
Medium Grades Water Proof Sheathing	*$0.65@1.25*
Deafening Felt, 9, 6 and 4½ sq. ft. to lb., ton	*$45.00*
Red Rope Roofing, 250 sq. feet per roll	*$1.65*

NOTE.—*These goods are often sold at delivered prices.*

Tarred Paper.

1 ply (roll 500 sq. ft.), ton	*$29.00@32.00*
2 ply, roll 108 sq. ft	*55@65c*
3 ply, roll 108 sq. ft	*77@87c*
Slater's Felt (roll 500 sq. ft.)	*70@75c*

NOTE.—*Above prices often include delivery.*

R. R. M. Stone Surfaced Roofing (roll 110 sq. ft.) $2.75

Sand and Emery—
List Dec. 23, 1899 ..... *60@60&10%*

Parers— Apple—
Advance ..... ₱ doz. $4.50
Baldwin ..... ₱ doz. $5.00
Bonanza Improved ..... each $0.50
Dandy ..... each $7.50
Eureka Improved ..... each $20.00
Family Bay State ..... ₱ doz. $15.00
Hudson's Little Star ..... ₱ doz. $4.00
Hudson's Rocking Table ..... ₱ doz. $5.50
Improved Bay State ..... ₱ doz. $36.00
New Lightning ..... ₱ doz. $7.50
Reading 72 ..... ₱ doz. $4.00
Reading 78 ..... ₱ doz. $7.00
Turn Table '98 ..... ₱ doz. $6.75
White Mountain ..... ₱ doz. $6.00

Potato—
Saratoga ..... ₱ doz. $7.00
White Mountain ..... ₱ doz. $6 00

Picks and Mattocks—
List Feb. 23, 1899 ..... *70@70c&10%*

Pigeons— Clay
Mark's Black Birds, f.o b. factory, per M $8.75
See also *Traps, Target.*

Pinking Irons—
See *Irons, Pinking.*

Pins— Escutcheon—
Brass ..... *60@60c&10%*
Iron, list Nov. 11, '85.. ..... *60@60c&10%*

Pipe, Cast Iron Soil—
Standard, 2-6 in. ..... *50c&10c&5%*
Extra Heavy, 2-6 in. ..... *65c&5%*
Fittings ..... *70c&5%*

Pipe Merchant, Boiler Tubes, &c.—

	Carload Lots.	
Merchant Pipe.	*Black.*	*Galvanized.*
½, ¾, 1, 1¼ inch	*68¼*	*58%*
1½ inch	*70¢*	*60%*
2 to 6 inch	*75%*	*65%*
7 to 12 inch	*75%*	*65%*

Less than carloads, 12½% advance.

Pipe Sewer—
Jobbers' Prices—
Standard Pipe and Fittings, 2 to 2¼ in. New England *70%*
New York and New Jersey *73%*
Maryland, Delaware, East Penn. ..... *7 %*
West Penn and West Va *76%*
Virginia *78%*
Ohio, Michigan and Ky *78%*
Carload lots are generally delivered.

Planes and Plane Irons—
Wood Planes—
Molding ..... *40¢2½@40¢5%*
Bench, First quality ..... *45¢10@45¢10¢5%*
Bench, Second qual ..... *60¢10@50¢10¢5%*
Bailey's (Stanley R. & L. Co) ..... 5&10@25&10&10%
Chapin-Stephens Co.:
Bench, Common (Pearce) ..... 50&10@50&10&5%
Bench Extra and Pemium ..... 45&10@45&10&5%
Molding ..... 40&2½@40&10%
Gage Self Setting 35%
Union 60%

Iron Planes—
Bailey's (Stanley R. & L. Co) ..... 25&10@25&10&10%
Chaplin's Iron Planes ..... 50&10%
Miscellaneous Planes (Stanley R. & L. Co.) ..... 20&10@20¢10&10%
Sargent's 60%
Union 60%

Plane Irons—
Wood Bench Plane Irons ..... *30¢5@30¢10¢5%*
Buck Bros 30%
Chapin-Stephens Co ..... 30¢30&10&5%
Stanley R. & L. Co ..... 20&10@20&10&10%
L. & I. J. White ..... 20&5@25%

Planters, Corn, Hand.
Kohler's Eclipse ..... ₱ doz. $9.00

Plates—
Felloe ..... *lb. 3¾@4c*
Self-Sealing Pie Plates (S. S. & Co.), ₱ doz. $2.00 ..... 50%

Pliers and Nippers—
Button Pliers ..... *75@75c&10%*
Gas Burner, per doz., 5 in., $1.15@ $1.20; 6 in., $1.35@1.45
Gas Pipe.. 7 8 10 12-in.
$1.75 $2.00 $2.15 $3.75
Acme Nippers ..... 50@50&5%
Bernard's: 95%
Parallel, Plier ..... 50&5%
Paragon Plier ..... 50&5%
Lodi Pliers ..... 50&5%
Elm City Fence 35%
Cronk & Carrier Mfg. Co.:
American Butto ..... 75&10%
Cronk's 60%
Improved Button ..... 70&10%
Stub's Pattern 50%
Combination and others 33⅓%
Heller's Farriers' Nippers, Pincers, and Tools 40&10@40&10&10%
P., S. & W. Tinners' Cutting Nippers, 30@30&10%
Swedish Side, End and Diagonal Cutting Pliers 50%
Utica Drop Forge & Tool Co.:
Pliers and Nippers, all kinds 40%

Plumbs and Levels—
Plumbs and Levels ..... *75@75c&10%*
Chapin-Stephens Co.:
Pocket Levels ..... 40@40&10&10%
Plumbs and Levels ..... 40@40&10&10%
Disston's Plumbs and Levels 70%
Disston's Pocket Levels 70%
C. E. Jennings & Co.'s Iron ..... 25&10%
C. E. Jennings & Co.'s Iron, Adjustable, 33⅓&10%
Stanley R. & L. Co ..... 40@40&10&10%
Stanley's Duplex ..... 20@20&10&10%
Woods' Extension 33⅓%

Poachers, Egg—
Buffalo Steam Egg Poachers, ₱ doz., No. 1, $3.00; No. 2, $ .00; No. 3, $4.00; No. 4, $12. 0..... .....; 50%

Points, Glaziers'—
Bulk and 1 lb. papers.. *lb. 8¼c@..*
½-lb. papers ..... *lb. 9 c@..*
¼-lb. papers ..... *lb. 9½c@..*

Pokes, Animal—
Ft. Madison Hawkeye ..... ₱ doz. $3.25
Ft. Madison Western ..... ₱ doz. $4.00

Police Goods—
Manufacturers' Lists ..... *25@25&5%*
Tower's 25%

Polish—Metal—
Burnishine Liquid, ₱ doz., ½ pt., $1.25; 1 pt., $2.00; 1 qt., $3.50.
Burnishine Paste, ₱ doz. 3 oz., $0.50; ½ lb., $1.25; 1 lb., $2.00.
Prestoline Liquid, No. 1 (½ pt.), ₱ doz. $3.00; No. 2 (1 qt.), $9.75 ..... 40%
Prestoline Paste ..... 40&10%
George William Hoffman:
U. S. Metal Polish Paste, 3 oz. boxes, ₱ doz. 50¢; ₱ gr. $4.50; ½ lb boxes, ₱ doz. $1.25; 1 lb boxes, ₱ doz. $2.25.
U. S. Liquid, 8 oz. cans, ₱ doz. $1.25; ₱ gr. $12.00.
Barkeepers' Friend Metal Polish, ₱ doz. $1.75; ₱ gr. $18.00.
Wynn's White Silk, ½ pt. cans, ₱ doz. $2.00

Stove—
Black Eagle Benzine Paste, 5 lb cans .. ₱ lb 10¢
Black Eagle, Liquid, ½ pt. cans ₱ doz. 75¢
Black Jack Paste, ¾ lb cans. ₱ gro. $9.00
Ladd's Black Beauty, gr. $10.00 ..... 50%
Joseph Dixon's, ₱ gr. $5.75 ..... 10%
Dixon's Plumbago ..... ₱ lb 8¢
Fireside ..... ₱ gr. $2.50
Gem, ₱ gr. $4.50 ..... 10%
Japanese ..... ₱ gr. $3.50
Jet Black ..... ₱ gr. $3.50
Peerless Iron Enamel, ½ pt. cans ..... ₱ doz. $1.50
Wynn's:
Black Silk, 5 lb pail ..... each 70¢
Black Silk, ½ lb box ..... ₱ doz. $1.00
Black Silk, 5 oz. box ..... ₱ doz. $0.75
Black Silk, ½ pt. liq ..... ₱ doz. $1.00

Window and Glass Cleaner.
The Glasbrite Company:
No. 1, 10-cent size, case of 2 doz.. $1.70
No. 3, 25-cent size, case of 1 doz.. $2.00
Mfgr's' size, 1-lb. cakes, each 3.35
Mfg s' size, 1-lb. cakes, per doz.. $3.00

Poppers, Corn—
1 qt., Square ..... *gro. $9.00*
1 qt., Round ..... *gro. $10.00*
1½ qt., Square ..... *gro. 11.00*
2 qt., Square ..... *gro. 13.00*

Post Hole and Tree Augers and Diggers—
See also *Diggers, Post Hole, &c.*

Potato Parers—
See *Parers, Potato.*

Pots— Glue—
Enameled *40%*
Tinned *35%*

Powder—
In Canisters:
Duck, 1 lb. each *45c*
Fine Sporting, 1 lb. each *75c*
Rifle, ½-lb. each *15c*
Rifle, 1-lb. each *25c*

King's Semi-Smokeless:	Shot Gun	Rifle
Keg (25 lb bulk)	$12 00	$15.00
Half Keg (12½ lb bulk)	6.25	7.75
Quarter Keg (6¼ lb bulk)	3.25	4.00
Case 24 (1 lb cans bulk)	14.00	17 00
Half case 12 (1 lb cans blk)	7.25	8 75

King's Semi-Smokeless:
Keg (25 lb bulk) $6.50
Half Keg (12½ lb bulk) $3.50
Quarter Keg (6¼ lb bulk) $1.90
Case 24 (1 lb cans bulk) $8.50
Half case (1 lb cans bulk) $4 50
King's Smokeless:
Keg (25 lb bulk) $12 00
Half Keg (12½ lb bulk) 6.25
Quarter Keg (6¼ lb bulk) 3.25
Case 24 (1 lb cans bulk) 14.00
Half case 12 (1 lb cans blk) 7.25

Presses— Fruit and Jelly—
Enterprise Mfg. Co ..... 20@25%
Sensible 33⅓%
2 qt., $2.00; 4 qt., $4.00; 10 qt., $6.00 each.

Seal Presses—
Morrill's No. 1, per doz. $20 00 ..... 50%
Morrill's No. 2, per doz. $22 50 ..... 50%

Pruning Hooks and Shears—See *Shears.*

Pullers Nail—
Cyclops 50%
Miller's Falls, No. 3, per doz. $12.00 ..... 33⅓&10%
Pearson No. 1, Cyclone Spike Puller, each $37.50 ..... 50%
Pelican, ₱ doz. $9.00 ..... 40&10%
Samson ..... ₱ doz $18.00
Scranton, Case Lots:
No. 1 (large), ₱ doz. $6.50; No. 2 (large), $5.75; No 3 (small), $5.00; No. 2-B (large), $5.50; No. 3-B (small), $4.00; No. 2-D (large), $4 50; No 3-D (small) $4.00.
Smith & Hemenway Co.:
Ajax 60%
Diamond B, No. 2, ca e lots. ₱ doz $6.00
Diamond B, No. 3, case lots. ₱ doz $5.50
Eureka 30%
Giant, No. 1, ₱ doz. $18; No. 2, $16.50; No. 3, $15 ..... 40¢
Yankee 66⅔%

Pulleys—Single Wheel—

Inch	2	2½	3
Awning ..doz.	$0.50	.75	1.00
Hay Fork, Swivelor Solid Eye..... doz., 4 in., $0.95; 5 in., $1.75			
Inch	2	2¼	2½
Hot House,doz	$0.60	.80	1.10
Inch	1¼	1½	1¾ 2
Screw....doz.	$0.14	.17	.20 .26
Inch	1¾	2	2¼ 2½
Side.....doz.	$0.27	.35	.48 .55
Inch	1½	1¾	2 2½
Tackle....doz.	$0.27	.37	.50 .80

Stowell's:
Ceiling or End, Anti-Friction.....60%
Dumb Waiter, Anti-Friction...60&10%
Hay Fork, Anti-Friction, 5-in. Wheel, ₱ doz. $12.00..... 50%
Electric Light 65%
Side, Anti-Friction..... 60&10%

Sash Pulleys—

Common Frame; Square or Round End per doz., 1¾ in., 13c; 2 in., 16c
Auger Mortise, no Face Plate, per doz. 1¾ in., 12c.; 2 in., 15c.
Auger Mortise, with Face Plate, per doz., 1¾ in., 13c.; 2 in., 15½c.
Acme.....1¾in., 16c; 2 in., 19c
Common Sense, 1¾ in.... ₱ doz., 18¢; 2 in., 20¢.
Fox-All-Steel, Nos. 3 and 7, 2¼ in. ₱ doz 25¢
No. 9, 1¾ in..... ₱ doz. 20¢
Extra for Plated Finish...₱ doz. 20¢
Extra for Anti-Friction Bronze Bushing..... ₱ doz 10¢
Grand Rapids All Steel Noiseless..... 40%
Ideal No. 13.....1¾ in., ₱ doz., 16¢
Niagara.....1¾ in., 16¢; 2 in., 19¢
No. 26, Troy....1¾ in., 14½¢; 2 in., 16½¢
Star ..... 1¾ in., 16¢; 2 in., 19¢
Tackle Blocks—See *Blocks.*

Pumps—

Cistern.....60@60&10%
Pitcher Spout.....75@75&10%
Wood.....50@50&10%
Pump Leathers, Lower and Plunger Valves—Per gro.:

Inch..	2	2¼	2½	2¾
	$2.20	2.50	2.75	3.00
Inch..	3	3¼	3½	3¾ 4
	$3.30	3.60	3.85	4.10 4.50

Barnes Dbl. Acting (low list)..... 50%
Contractors' Rubber Diaphragm No. 2 R. & L. Block Co..... $15.00
Flint & Walling's Fast Mail (low list).55%
Flint & Walling's Pitcher Spout..... 75%
Loud's Suction Pumps, U. d. Co..... 20%
Myer's Pumps, low list 50%
Myers' Power Pumps..... 30%
Myers' Spray Pumps..... 30&10%

Punches—

Saddlers' or Drive, good..doz. 65@70c
Spring, single tube, good quality... $1.75@3.00
Revolving (4 tubes)...doz. $3.75@4.00
Bemis & Call Co.'s Cast Steel Drive....50%
Bemis & Call Co.'s Check..... 55%
Bemis & Call Co.'s Spring..... 50%
Morrill's No. 1 (A. B. C.), ₱ doz., $15.00..30%
No. 2, ₱ doz. $22.50..... 30%
No. 2, Metal, ₱ doz., $45.00..... 30%
Bench Punch, each, $30.00 ..... 30%
Niagara Hollow Punches..... 40%
Niagara Solid Punches..... 55&10%
Steel Screw, B. & K. Mfg. Co..... 40%
Tinners Hollow, P., S. & W. Co. 35&35&5%
Tinners' Solid, P., S. & W. Co., ₱ doz., $1.44..... 60%

Rail—Barn Door, &c.—

Cast Iron, Barn Door: Flange Screw Holes for Rd. Groove Wheels:

½	⅝	¾ In.
$1.70	$2.10	$5.00 100 feet.

Angular for Sq. Groove Wheels:

Small.	Med.	Large.
$1.60	1.95	2.70 100 feet.

Sliding Door, Brnzed Wr't Iron, ft. 6½c
Sliding Door, Iron Painted....2½@3c
Sliding Door, Wrought Brass, 1¼ in..... lb. 36c..30%
Allith Mfg Co. Reliable Hanger Track ₱ foo..... 10¢
Cronk's Double Braced Steel Rail, ₱ foot..... 3½¢
Cronk's O. N. T. Rail..... 3½¢
Lanes' O. N. T., ₱ 100 ft., 1 inch, $3.10; 1¼ inch, $3.95; 1¼ inch, $4.85.
Lanes' Standard, ₱ 100 ft..... 3.75
Lawrence Bros.' ..... ₱ ft. 4½¢
Lawrence Bros. New York ..... 3½¢
McKinney's Hinged Hanger Rail ₱ foot 4¢..... 55%
McKinney's None Better..... ₱ ft. 3½¢
McKinney's Standard..... ₱ ft. 4 ¢
Myer's Stay on Track ..... 50&10%
Smith's Wrought Bracket, Plain.....3½¢
Smith's Special..... 4½¢
Smith's Never Jump, per ft. 11¢..... 30%
Smith's Plain Steel..... 30%
Smith's Milled Steel..... 4½¢
Stowell's Cast Rail ..... 1½¢
Stowell's Steel Rail, Plain..... 25%
Stowell's Wrought Bracket, Plain ..... 3½¢
Swett's Hyl. p. r ft. 11¢..... 50&10%
Swett's P. L. B. S eel Rail, ₱ 100 ft. $3.00

Rakes—

Net Prices, Malleable Rakes:

	10	12	14	16-tooth
Shank	$1.50	1.60	1.75	1.85
Socket	1.65	1.80	1.95	2.10

Steel, August 1, 1899, List ..70¢5¢10%
Malleable..... 70¢10@75¢5%
Lawn Rakes, Metal Head, per doz.. 20 teeth..... $3.25@3.50
24 teeth..... $3.60@3.75
Fort Madison Red Head Lawn $3.25
Fort Madison Blue Head Lawn $3.00
Jackson Lawn, 20 and 30 teeth ₱ doz. $4.00
Kohler's:
Lawn Queen, 20-tooth, ₱ doz.....$3.60
Lawn Queen, 24-tooth, ₱ doz. $4.75
Paragon, 20-tooth, ₱ doz..... $2.85
Paragon, 24-to th, ₱ doz..... $3.00
Steel Garden, 14-tooth, ₱ doz. $3.00
Malleable Garden, 14-tooth ₱ doz. $2.25

Rasps, Horse—

Diston's..... 75%
Heller Bros..... 7 &5&20 &10&5%
McCaffrey's American Standard..... 60&10&5%
New Nicholson ..... 70&10%
See also *Files*

Razors—

Boracic ..... 60&10%
Fox Razors, No. 42...₱ doz. $40.00 } dis. 40%
Fox Razors, No 44...₱ d z. $20.00 }
Fox Razors, No. 82, Platina, ₱ doz. $25.00
Rad Devil..... 60%
Silberstein:
Carbo Magnetic..... $18.00
Griffon, No. 65..... $15.00
Griffon, No. 00..... $12.00
All other Razors..... 40%
Safety Razors..... 40%

Safety Razors—

New Gem, in Tin Boxes.....₱ doz. $12.00
New Gem, Extra Blades .....₱ doz. $8.35
Gem Outfits (Razor, Strop, etc.) ₱ doz. $ 5.60
Complete Razor, extra Blade in Leather Case..... ₱ doz. $27.00

Reels—Fishing—

Bishop's Independent Fish Reel Spooler, ₱ doz..... $30.00
Hendryx: M 5, Q 6, A 6, B 6, M 9¼ 4008, Silver Rubber Populo, Nickeled Populo, Aluminum, German Silver, Bronze, 3 01 N, 6 N, 4 N to 8 PN..... 33⅓%
6 RW 102 P and RN, 202 P and PN. 40%
G 5..... 20%
24 N to 28 PN..... 35&10&10%
124 N, 974 PN, 002004 PN, 1020 R and PRN, 202 PR and PRN.... 50&5%
2004 N..... 40&10&5%
5009 PN and N..... 50%
2904 P..... 50&10&5%
2904 PN..... 60%
0925 N..... 40&10%
02004 N..... 45&12½&5%
Single Action Trout..... 40&10%
986 P N, 802 and 803 N..... 0&10%
Competition, 304 and 304 PN 35%
00304 P and PN..... 40&5%
Safety and Salmon..... 30%
Shakespeare, Style C..... 25%

Registers—*List Sept. 2, 1901.*

Black Jap	75&10 @8%
White Jap	
Bronzed	
Nickel Plated	
Electro Plated	

There is a good deal of irregularity in prices of Registers.

Revolvers—

Single Action..... 85@90c
Double Act n, except 44 cal. $1.35@1.50
Double Action, 44 calibers. $1.60@1.65
Automatic ..... $2.75@3.00
Hammerless..... $3.25@3.50

Riddles, Grain or Sand—

16 in. per doz..... $2.75@3.00
17 in. per doz..... $3.00@3.25
18 in. per doz..... $3.25@3.50

Rings and Ringers—

Bull Rings—

	2	2½	3 Inch.
Steel	$0 70	0.75	0.80 doz.
Copper	1.00	1.10	1.35 doz.

Hog Rings and Ringers—

Hill's Rings....gro. boxes, $4.75@4.50
Hill's Ringers, Gray Iron. doz. 55@60c
Hill's Ringers, Mal. Iron, doz. 75@80c
Blair's Rings.....per gro. $5.00@5.25
Blair's Ringers....per doz. $0.60@ .65
Brown's Rings....per gro. $5.50@5.75
Brown's Ringers...per doz. $0.75@1.00
Rapid Rings..... ₱ gro. $6.00
Rapid Ringers..... ₱ doz. $3.50

Rivets and Burrs—

Copper..... 50¢10¢
Iron or Steel:
Tinners'..... 75@75¢10%
Miscellaneous..... 75@75¢10%

Rollers—

Acme, Stowell's Anti-Friction..... 50%
Barn Door, Sargent's list..... 60%
Cronk's Stay..... 66⅔%
Cronk's Brinkerhoff..... 66⅔%
Lane's, Stay..... 33⅓&5%
Stowell's Barn Door Stay...₱ doz. $1.25

Rope—

Manila, 7-16 in. and larger, Manila, 7-16 in. and larger, tarred or untarred...lb. 11 @11½c
Manila..... ⅜-inch lb. 11½@12 c
Manila ¼ & 5-16 in.... lb. 12 @12½c
Manila Hay, Hide and Bale, Ropes Medium and Coarse..... lb. 12 @12½c
Sisal, 7-16 in. and larger lb. 7¾@ 9½c
Sisal..... ⅜-inch..lb. 8¼@10 c
Sisal, ¼ and 5-16 in.... lb. 8¾@10¾c
Sisal, Hay, Hide and Bale Ropes, Medium and Coarse..... lb. 7¾@ 9½c
Sisal, Tarred, Medium Lath Yarn..... lb. 7¼@ 9 c
Cotton Rope:
Best..... ¼-in. and larger lb. 13½c
Medium..¼-in. and larger lb. 11 c
Common..¼-in. and larger lb. 9 c
Jute Rope:
Thread No. 1, ¼ in. and up lb. 6½c
Thread No. 2, ¼-in. and up lb. 6 c
Yarn, ¼ in. and up... lb. 5 @5½c

Wire Rope—

Galvanized..... 40¢5%
Plain..... 45¢5%

Ropes, Hammock—

Covert Mfg. Co..... 45&2%
Covert Saddlery Works..... 60&5%

Rules—

Boxwood..... 60@5@60¢10¢5%
Ivory..... 35¢10@35¢10¢10%
Chapin-Stephens Co.:
Boxwood..... 60 &60&10%
Ivory..... 35&10@35&10&10%
Miscellaneous..... 50&10@50&10&10%
Patent Combination..... 55@55&10%
Standard Rulers..... 10@10&10%
Lufkin's Steel..... 50&10%
Lufkin's Lumber..... 60&10%
Stanley R. & L. Co.:
Boxwood..... 40@30&10%
Ivory..... 35@35&10&10%
Upson Nut Co.:
Boxwood..... 60@30&10%
Ivory..... 35&10@35&10&10%

Sash Locks—See *Locks, Sash*

Sash Weights—

See *Weights, Sash.*

Sausage Stuffers or Fillers

—see *Stuffers or Fillers, Sausage.*

Saw Frames—See *Frames, Saw.*

Saw Sets—See *Sets, Saw.*

Saw Tools—See *Tools, Saw.*

Saws—

Atkins:
Circular..... 50@50&10%
Band..... 50&10@60%
Cross Cuts..... 35&5%
Mulay, Mill and Drag..... 50&10%
One-Man Saw..... 40%
Wood Saws..... 40%
Hand, Compass, &c..... 40%
Chapin-Stephens Co.: Turning Saw Frames and Saws..... 30@30&10%
Diamond Saw and Stamping Works: Sterling Kitchen Saws..... 25%
Disston's:
Circular Solid and Inserted Tooth. 50%
Band 3 to 14 in. wide..... 60%
Band 1¼ to 2¾..... 70%
Crosscuts..... 45%
Narrow Crosscuts..... 50%
Mulay, Mill and Drag..... 50%
Framed Woodsaws..... 35%
Wood-saw Blades..... 35%
Woodsaw Rods..... 25%
Hand Saws, Nos. 12, 99, 9, 16, d100, D8, 120, 78, 77, 8..... 25%
Hand Saws, Nos. 7 107, 107½, 3, 1, 0, 00, Combination..... 30%
Compass, Keyhole, &c..... 25%
Butcher Saws and Blades..... 35%
C. E. Jennings & Co.'s:
Back Saws..... 25&10%
Butcher Saws..... 3 &10%
Compass and Key Hole Saws. 35&5&10%
Framed Wood Saws..... 30&10%
Hand Saws..... 20&2½&8%
Wood Saw Blades..... 30&10%
Millers Falls:
Butcher Saws..... 15&10%
Star Saw Blades..... 15&10%
Peace:
Circular and Mill 50%
Cross Cuts, list Jan. 1, '99..... 50%
Hand, Panel and Rip..... 30%
Richardson:
Circular and Mill 50%
Hand, &c..... 30%
X Cuts, list Jan. 1, '99..... 50%
Simonds':
Circular Saws..... 50%
Crescent Ground Cross Cut Saws. 35%
One-Man Cross Cuts..... 40&10%
Gang Mill, Mulay and Drag Saws. 50%
Band Saws..... 50%
Back Saws..... 25&25&7½%
Butcher Saws..... 35&35&7½%
Hand Saws..... 25&25&7½%
Hand Saws, Bay State Brand..... 45%
Compass, Keyhole, &c ..... 25&25&7½%
Wood Saws ..... 35@35&7½%

Hack Saws—

Disston:
Concave Blades..... 25%
Keystone..... 40%
Hack Saw Frames..... 30%
C. E. Jennings & Co.'s:
Hack Saw Frames, Nos. 175, 180.... 35&5&10%
Hack Saws, Nos. 175, 180, complete. 35&5&10%
Griffin's Hack Saw Frames .. 35&5&10%
Griffin's Hack Saw Blades..... 35&5&10%
Star Hack Saws and Blades..... 15&10%
Sterling Hack Saw Blades 25%
Sterling Hack Saw Frames 20%

Scroll—

Barnes' No. 7, $15..... 25%
Barnes' Scroll Saw Blades..... 40%
Barnes' Velocipede Power Scroll Saw, without boring attachment, $18; with boring attachment, $20..... 20%
Lester, complete, $10.00..... 15&10%
Rogers, complete, $4.00..... 15&10%

Scalers Fish—

Bishop's Lightning..... ₱ doz. $3.00
Covert's Saddlery Works ..... 60&10%

Scales—

Family, Turnbull's..... 30@30¢10%
Counter:
Hatch, Platform, ½ oz to 8 lbs. doz $5.50
Two Platforms, ½ oz to 8 lbs. doz. $16
Union Platform, Plain..$1.70@1.90
Union Platform, Striped $1.85@2.15
Chatillon's:
Eureka..... 25%
Favorite..... 40%
Grocers' Trip Scales..... 50%
Pelouze Scales—Household, Counter, Candy, Ice, Postal, Computing..... 50%
"The Standard" Portables 45%
"The Standard" R. R. and Wagon.. 60%

Scrapers—

Box, 1 Handle ..... doz $2.25@2.50
Box, 2 Handle..... doz. $3.00@3.50
Ship... Light $2.50; Heavy $5.00
Adjustable Box Scraper (S. R. & L. Co.) $6.00..... 30&30&10%
Chapin-Stephens Co., Box Scrapers.... 50&50&10%

Screens, Window, and Frames—

Bonanza Window Screens..... 60@60&5%
Fiver Pattern Window Screen..60@60&5%
Maine Window Screen Frames 40&10&5%
Perfection Window Screens..... 60@60&5%
Phillips' Window Screen Frames. 60&10&5%
Porter's Hummer Window Screens. 60@60&5%
Porter's Klondike Window Screens .. 60&2½@60&7½%
Wabash Spring Adj. Screen. 50%
See also *Doors.*

Screw Drivers—

See *Drivers, Screw.*

Screws—Bench and Hand—

Bench, Iron..doz. 1 in., $1.75@3.00; 1¼, $2.25@3.50; 1¼, $3.85@4.25
Bench, Wood, Beech..doz. $3.00@3.50
Hand, Wood..... 30@30&5%
Hand, R. Bliss Mfg. Co..... 25%
Hand, Chapin-Stephens Co..... 30@30&10%

Coach, Lag and Hand Rail—

Lag, Common Point, list Oct. 1, '99..... 70¢15@...%
Coach and Lag, Gimlet Point, list Oct. 1, '99..... 7 ¢10@...%
Hand Rail, list Jan. 1, '81. 60¢10@...%

Jack Screws—

Standard List... 75¢10@80¢5%
Millers Falls..... 50&10&10%
Millers Falls, Roller ..... 50&10%
P., S. & W..... 50@50&10%
Sargent..... 70&10%

Machine—

List Jan. 1, '98.
Flat or Round Head, Iron. 50@50¢10%
Flat or Round Head, Brass 50@50¢10%

Set and Cap—

Set (Iron or Steel) 70%
Sq. Hd. Cap.. ..... 65%
Hex. Hd. Cap 65%
Rd. or Fillister Hd. Cap 60%

Wood—

List Jan. 1, 1900.
Manufacturers' printed discounts:
Flat Head, Iron..... 87½@90%
Round Head, Iron..... 85@87½%
Flat Head, Brass ..... 85@87½%
Round Head, Brass..... 82½@85%
Flat Head, Bronze..... 75@80%
Round Head, Bronze..... 72½@77½%
Drive Screws..... 87½@90%
NOTE.—*Extra 10&10&5% often given.*

Scroll Saws—See *Saws, Scroll.*

Scythes—*Per doz.*

Clipper Pattern, Grass..... $4.25
Full Polished Clipper.... ..... $4.75
Grain $7.00
Clipper, Grain..... $7.50
Wood and Bush $4.50

Scythe Snaths—

See *Snaths, Scythe.*

Seeders—Raisin—

Enterprise..... 25@30%

Sets—Awl and Tool—

Brad Awl and Tool Sets:
Wood Hdle., 10 Awls doz. $2.00@2.25
Wood Hdle., 14 Awls, 6 Tools ... doz. $2.50@2.60
Aiken's Sets, Awl and Tools:
No. 20, ₱ doz. $10.00..... 50&10&10%
Fray's Adj. Tool Hdls....Nos. 1, $12; 2, $18; 3, $12; 4, $3; 5, $7..... 50%
C. E. Jennings & Co.'s Model Tool Holders ..... 33⅓&10%
Millers Falls Adj. Tool Hdls, No. 1, $12; No. 4, $12; No. 5, $18 .... 15&10%
Stanley's Excelsior:
No. 1, $7.50; No. 2 $4.00; No. 3, $5.50..... 30&30&10&10%

Garden Tool Sets—

Ft. Madison, Three Pcs. Hoe, Rake and Shovel.....₱ doz. sets.....$9.00

Nail—

Square.....per gro. $2.25@2.50
Round, Blk. and Pol., assorted..... gro. $1.80@2.50
Octagon.....gro. $4.00@4.25
Knurled, Good.....gro. $5.75@6.00
Buck Brothers..... 27½%
Cannon's Diamond Point, ₱ gr. $12..25%
Mayhew's.....per gro. $9.00
Snell's Corrugated, Cup Pt. per gro. $7.50
Snell's Knurled, Cup Pt....per gro $7.50

Rivet—

Regular list..... 70¢10@75%

Saw—

Aiken's:
Genuine..... 50&10%
Imitation ..... 50&10%
Atkin's.:
Criterion..... 40%
Adjustable..... 40%
Bemis & Call Co's.:
Cross Cut..... 30%
Hammer, new Pat..... 45%
Plate..... 20%
Spring Hammer..... 60%
Diston's Star and Monarch..... 25%
Morrill's No. 1, $15.00..... 50%
Nos. 3 and 4, Cross Cut, $20.63..... 50%
No. 5, Mill, $30.00..... 50%
Nos. 10, 11, 95, $15.63..... 50%
No. 1 Old Reliable, $10.00..... 50%
Taintor Positive, ₱ doz. $18..... 60%

Sharpeners Knife—

Chicago Wheel & Mfg. Co..... 65%
Smith & Hemenway Co..... 70%

Shaves Spoke—

Iron.....doz. $1.00@1.15
Wood.....doz. $1.65@2.25
Bailey's (Stanley R. & L. Co.)..... 50@50&10&10%
Chapin-Stephens Co ..... 50@50&10&10%
Goodell's, ₱ doz. $9.00..... 15&10%
Wood's Fl and F2..... 50%

Shears—

Cast Iron...	7	8	9 in.
Best	$16.00	18.00	20.00 gro.
Good	$13.00	15.00	17.00 gro.
Cheap	$5.00	6.00	7.00 gro.

Straight Trimmers, &c.:
Best quality, Jap..... 70@70¢10%
" Nickel..... 60@60¢10%
Fair qual. Jap..... 80@80¢5%
" Nickel..... 75@75¢10%
Tailors' Shears..... 40@40¢10%
Acme Cast Shears..... 40@40&5%
Geneva..... 60%
Heinisch's Tailors' Shears..... 40%
Wilkinson's Hedge..... 1900 list, 45%
Wilkinson's Pruning..... 40%
Wilkinson's Sheep..... 1900 list, 25%

Tinners' Snips—

Steel Blades..... 20¢5@7 ¢10%
Steel Laid Blades..... 40¢10@50%
Forged Handles, Steel Blades, Berlin..... 10@10&10%
Jennings & Griffith Mfg. Co's. 6½ to 10 inch..... 40&7½&10%
Niagara Snips..... 40%
P. S. & W. Co..... 20%

Pruning Shears and Tools—

Cronk's Grape Shears..... 33⅓%
Cronk's Pruning Shears..... 33⅓%
Diston's Combined Pruning Hook and Saw, ₱ doz. $18.00..... 25%
Diston's Pruning Hook, ₱ doz. $12.00 25%
John T. Henry Mfg. Company: Pruning Shears, all grades..40@40&5% Orange Shears..... 50&10&50&20% Grape..... 40&10@50% Tree Pruners..... 75% Nagley's Pruning Shears..... 10&5% Nagley's Tobacco Shears..₱ doz. $15.00
P. S. & W. Co..... 33⅓%

Sheaves—Sliding Door—

Stowell's Anti-Friction..... 50%
Patent Roller Hatfield's, Sargent's list. 70&10%
Reading..... 70&10@75%
P. & F. H..... 33⅓%
Wrightsville, Hatfield Pattern..... 80%

Sliding Shutter—
Reading list.....70&10@75%
R. & E. 4 st.....33⅓%
Sargent's list.....50&10%

Shells—Shells, Empty—
Brass Shells, Empty:
First quality, all gauges.....60&5%
Climax, Club, Rival, 10 and 12 gauge.....65&5%
Paper Shells, Empty:
Acme, Ideal, Leader, New Rapid, Magic, 10, 12, 16 and 20 gauge..25&5%
Blue Rival, New Climax, Challenge, Monarch, Defiance, New Victor, Repeater, Yellow Rival, 10, 12, 15 and 20 gauge.....20%
Climax, Union, League, New Rival 10 and 12 gauge.....25%
Climax, Union, League, New Rival, 14, 16 and 20 gauge (87.50 list)..20%
Expert, Metal Lined and Pigeon, 10, 12, 16 and 20 gauge.....33⅓&5%

Shells, Loaded—
Loaded with Black Powder.....40&5%
Loaded with Smokeless Powder, medium grade.....40&10%
Loaded with Smokeless Powder, high grade.....40&10&10&5%

Shoes Horse, Mule, &c.—
F. o. b., Pittsburg:
Iron.....*per keg $3.85*
Steel.....*per keg 3.60*
Burden's, all sizes, ₱ keg.....$3.90

Shot—
Drop, up to B, 25-lb. bag.....$1.35
Drop, B and larger, per 25-lb. bag$1.60
Buck, 25-lb. bag.....$1.40
Chilled, 25 lb. bag.....$1.60
Dust Shot, 25-lb. bag.....$1.10
Markle's Chilled.....$1.90
Raymond Chilled——.....$1.30
Sparks Chilled.....$1.60
Tatham's Chilled.....$1.60

Shovels and Spades—
Association List, Nov. 15, 1902....40%

Sieves and Sifters—
Hunter's Imitation, gro. $11.00@11.50
Buffalo Metallic Blued, S. S. & Co., ₱ gr.:

14&16	16&18	18&20
$12.90	$13.80	$15.00

National Mfg. Co.:
Victor.....per gro. $12.00
Surprise.....per gro. $11.00
No Name.....per gro. $11 00
Shaker (Barler's Pat.) Flour Sifters, ₱ doz., $3.00.....30%

Sieves, Tin Rim—
Per dozen

Mesh	14	16	18	20
Black, full size	$1 20	1.25	1.30	1.35
Plated, full size	$1.30	1.35	1.40	1.45
Black, scant	$0.95	1.00	1.05	

Sieves, Wooden Rim—
Nested, 10, 11 and 12 Inch.
Mesh 18, Nested, doz.....$0.65@0 75
Mesh 20, Nested, doz.....75@ .85
Mesh 24, Nested, doz.....90@1.00

Sinks—
Cast Iron—
Standard list.....60@60&10%
NOTE.—*There is not entire uniformity lists used by jobbers.*

Skeins Wagon—
Cast Iron.....70@70&10%
Malleable Iron.....40&10@50%
Steel.....40@40&10%

Slates, School—
Factory Shipments.
"D" Slates.....45%
Noiseless Slates.....60&5 tens &5%
Wire Bound.....50%

Slaw Cutters—See *Cutters.*

Slicers, Vegetable—
Sterling No. 10, $2.00.....33⅓

Snaps, Harness—
German.....40@40&10%
Covert Mfg. Co.:
Derby.....3,&2%
High Grade.....45&2%
Jockey.....4 &2%
Trojan.....45&2%
Yankee.....35&2%
Yankee, Roller.....30&2%
Covert's Saddlery Works:
Crown.....60%
German.....60%
Model.....60%
Triumph.....60%
W. & E. T. Fitch Co.:
Bristol.....40&10%
Empire.....50&5%
German.....40%
National.....50&5%
Perfect.....45%
Clipper.....50&5%
Champion.....40%
Security.....40%
Victor.....60&5%
Oneida Community:
Solid Steel.....60&5%
Solid Swivel.....60%
Sargent's Patent Guarded.....66⅔&10%

Snaths—
Scythe.....50@50&10%

Snips, Tinners'—See *Shears.*

Soldering Irons—
See *Irons, Soldering.*

Spoke Trimmers—
See *Trimmers, Spoke.*

Spoons and Forks—
Silver Plated—
Good Quality.....50&10@60&10&5%
Cheap.....60@60&10%
International Silver Co.:
1847 Rogers Bros. and Rogers & Hamilton.....40&10%
Rogers & Bro., William Rogers Eagle Brand.....50&10%
Anchor, Rogers Brand.....60%
Wm. Rogers & Son.....60&10%
Simeon L. & Geo. H. Rogers Co.:
Silver Plated Flat Ware.....60%
No. 57 Silver Plated Ware.....60&10%

Miscellaneous—
German Silver.....60@60&10%
Cattaraugus Cutlery Co.:
Yukon Silver.....50%
Simeon L. & Geo. H. Rogers Co.:
German or Nickel Silver, Special list 1.&10%

Tinned Iron—
Teas.....*per gro. 45@50c*
Tables.....*per gro. 90c@$1.00*

Springs—Door—
Gem (Coil).....20%
Star (Coil).....30%
Torrey's Rod, 39 in.....₱ dos. $1.10
Victor (Coil).....50&10&10%

Carriage, Wagon, &c.
1¼ in. and Wider:
Black or ⅛ Bright, lb.....5¼c
Bright, lb.....5½c
Painted Seat Springs:
1½ x 2 x 26, per pr.....51@55c
1½ x 2 x 28 per pr.....60@65c
1½ x 3 x 28 and narrower, per pr. 85@90c
Cliff's Springs:
Bolster.....40%
Seat.....per pair 50c
Pole, per pair, ⅝ in. $1.10; ¾ in. $1.25

Sprinklers, Lawn—
Enterprise.....25@30%
Mackey.....₱ doz. $1.80
Philadelphia No. 1, ₱ dos. $12; No. 2, $15; No. 3, $24.....30%

Squares—
Nickel plated.....} *List Jan. 5, 1900.*
Steel and Iron.....} 70&10%
Rosewood Hdl Try Squire and T-Bevels.....60&10@10&70%
Iron Hdl. Try Squares and T-Bevels. 50&10@40&10&10%
Disston's Try Sq. and T-Bevel's.....70%
Winterbottom's Try and Miter.....40&10@40&10&10%

Squeezers—Lemon—
Wood, Common, gro., No. 0, $5.25 @$5.50; No. 1, $6.25@$6.50.
Wood, Porcelain Lined.
Cheap.....*doz. $2.40@2.75*
Good Grade.....*doz. $3.00@3.50*
Tinned Iron.....*doz. $0.75@1.25*
Iron, Porcelain Lined doz. $2.90@3.25

Staples—
Barbed Blind.....*lb. 6@6½c*
Electricians', Association list.....80&10&10&10%
Fence Staples, See Trade Report.
Galvanized, 15c less than Barb Wire
Polished 20c less than Barb Wire.
Poultry Netting, Staples....*per lb.* 3¼@3¼c
Grand Crossing Tack Co.'s list.....80&10%

Steels, Butchers'—
Dick's.....30%
Foster Bros'.....30%
Hartzell Cutlery Co.....60&5%
C. & A. Hoffmann's.....40%

Steelyards.....25&10@30&10%

Stocks and Dies—
Blacksmiths'.....40&10@50%
Curtis Reversible Ratchet Die Stock.25%
Derby Screw Plates.....25%
Gardner Die Stocks No. 1.....50%
Gardner Die Stocks, larger sizes.....40%
Green River.....25%
Lightning Screw Plate.....25%
Little Giant.....25%
Reece's New Screw Plates.....25@30%

Stone—
Scythe Stones—
Chicago Wheel & Mfg. Co:
Gem Corundum, 10 inch, $8.00 per gro., 12 inch, $10.
Pike Mfg. Co. 1901 list:
Black Diamond S. S....₱ gro. $12.00
Lamoille S. S.....₱ gro. $11.00
White Mountain S. S....₱ gro. $9.00
Green Mountain S. S....₱ gro. $6.00
Extra Indian Pond S. S. ₱ gro. $7.50
No. 1 Indian Pond S. S. ₱ gro. $7.00
No. 2 Indian Pond S. S. ₱ gro. $4.50
Leader Red End S. S....₱ gro $4.50
Balance of 1901 list 33⅓%

Oil Stones, &c.
Chicago Wheel & Mfg. Co., 1901 list:
Gem Corundum Oil, Double Grit.....50%
Gem Corundum Axe, Single or Double Grit.....55%
Gem Corundum Slips.....55%
Gem Corundum Razor Hones.....50%
Pike Mfg. Co. 1901 list:

	₱ lb.	
Arkansas Stone, No. 1, 3 to 5½ in.	$2.80	33⅓%
Arkansas Stone, No. 1, 5½ to 8 in.	$3.50	
Arkansas Slips No. 1	$4.00	
Lily White Washita 4 to 8 in	60¢	
Rosy Red Washita, 4 to 8 in	60¢	
Washita Stone, Extra, 4 to 8 in.	50¢	25%
Washita Stone, No. 1, 4 to 8 in.	40¢	
Washita Stone, No. 2, 4 to 8 in.	30¢	
Lily White Slips	90¢	
Rosy Red Slips	90¢	
Washita Slips, Extra	80¢	
Washita Slips, No. 1	70¢	
India Oil Stones (entire list)		25%
Hindostan No. 1, Regular	₱ lb 8¢	33⅓%
Hindostan No. 1 Small	₱ lb 10¢	
Axe Stones (all kinds)		33⅓%
Turkey Oil Stones, ex. 5 to 8 in.	₱ lb 80¢	
Queer Creek Stones, 4 to 8 in.	20¢	33⅓%
Queer Creek Slips	0¢	
Sand Stone	3¢	40%
Belgian, German and Swaty Razor Hones		40%
Natural Grit Carving Knife Hones, ₱ doz	$3.00	
Quick Edge Pocket Knife Hones, ₱ doz	$2.160	33⅓%
Mounted Kitchen Sand Stone, ₱ doz	$1.50	

Stoners—Cherry—
Enterprise.....25@30%

Stops, Bench—
Millers Falls.....15&10%
Morrill's.....₱ doz., No. 1, $10.00.....50%
Morrill's, No. 2, $12.50.....50%

Plane—
Chapin-Stephens Co.....30%

Window—
Ives' Patent.....25&5%

Stove Boards—
See *Boards, Stove.*

Stove Polish—See *Polish, Stove.*

Straps—Pox—
Cary's Universal case lots.....20&10%

Hame—
Covert's Saddlery Works.....60&10%

Stretchers, Carpet—
Cast Iron, Steel Points....*doz. 55@60c*
Socket.....*doz. $1.75*

Stuffers Sausage—
Enterprise Mfg. Co.....25@25&7½%
National Specialty Mfg. Co., list Jan. 1, '97.....30%

Supports, Porch—
Hoffman's Porch Supports....₱ doz. 25¢

Sweepers, Carpet—
National Sweeper Co.: Per doz.
Marion, Roller Bearing, regular finishes, full Nickel.....$24.00
Marion Queen, Roller Bearing, Fancy Veneers, full Nickel.....$27.00
Monarch, Roller Bearing, Nickel..$22.00
Monarch, Roller Bearing, Japanned.$20.00
Marion Queen, Roller Bearing, Regular Finishes, full Nickel.....$24.00
Transparent, Roller Bearing, Plate Glass Top, Nickel.....$32.00
Monarch Extra, Roller Bearing, (17-inch case), Nickel.....$36.00
Monarch Extra, Roller Bearing (17-inch case), Japanned.....$33.00
Perpetual, Regular Bearings, Nkl.$20.00
Perpetual, Regular Bearings, Jap.$18.00
NOTE.—*Discount of 50c per dozen on three-dozen lots. Discount of $1 per dozen on five-dozen lots.*

Tacks Brads, &c.—
List Jan. 15, '99.
Carpet Tacks, American.....
90c&25c&5@....%
American Cut Tacks..90c&20c&5@....%
Swedes Iron Tacks....90c&30c&5@....%
Swedes Upholsterers' Tacks.....
90c&5&10c&5@....%
Gimp Tacks.....*90c&5c&5@....%*
Lace Tacks.....*90c&50@....%*
Trimmers' Tacks..90c&30c&10c&5@....%
Looking Glass Tacks...70c&10@....%
Bill Posters' and Railroad Tack....
90c&5c&5@....%
Hungarian Nails....80c&20c&5@....%
Common and Patent Brads.....*80c&10%*
Trunk and Clout Nails...80c&5@....%
NOTE.—*The above prices are for straight Weights.* An extra 5% is given Star Weights** and an extra 10c&5% on Standard Weights.****

Miscellaneous—
Double Point Tacks.....*90 and 5 tens*
Steel Wire Brads, E. & E. Mfg. Co.'s list.....*50c&10@60%*
See also *Nails, Wire.*

Tanks, Oil—
Emerald, S. S. & Co.....30-gal $3.40
Emerald, S. S. & Co.....60-gal., $4.25
Queen City S. S. & Co., 30-gal.....$3.65
Queen City S. S. & Co., 60-gal.....$4.50

Tapes, Measuring—
American Asses' Skin.....*50c&10@50%*
Patent Leather.....*25@35c&5%*
Steel.....*40@40c&5%*
Chesterman's.....*25c&25c&5%*
Eddy's Steel.....40@40&5%
Eddy's Metallic.....33⅓@33⅓&5%
Keuffel & Esser Co., Steel and Metallic, Lower list, 1899.....35%
Lufkin's Steel.....33⅓@35%
Lufkin's Metallic.....30@30&5%

Teeth, Harrow—
Steel Harrow Teeth, plain or headed, 5/8 inch and larger, per 100 lbs. $2.35c

Thermometers—
Tin Case.....*80c&10@80c&10c&5%*

Ties, Bale—Steel Wire.
Single Loop.....*80@80c&10%*
Improved, Monitor, Cross Head, Etc.....*70%*

Ties, Wall—
Cleveland Wire Spring Co.:
Galv. Steel 5-32 x 6½ in. ₱ 1000..$10.00
Galv. Steel 5-32 x 8½ in. ₱ 1000..$11.00
Galv. Steel 5-32 x 11½ in ₱ 000..$12.00
Galv. Steel 5-32 x 15½ in. ₱ 1000 $14.00

Tinners' Shears, &c.—
See *Shears, Tinners', &c.*

Tinware—
Stamped, Japanned and Placed, sold very generally at net prices.

Tips, Safety Pole—
Covert's Saddlery Works.....60&10%

Tire Benders, Upsetters, &c.—See *Benders and Upsetters, Tire.*

Tobacco Cutters—
See *Cutters, Tobacco.*

Tools—Coopers'—
L. & I. J. White.....20@20&5%

Saw—
Atkins' Cross Cut Saw Tools.....40%
Simonds' Improved.....33⅓%
Simonds' Crescent.....25%

Ship—
L. & I. J. White.....25%

Transom Lifters—
See *Lifters, Transom.*

Traps—Fly—
Balloon, Globe or Acme.....
doz. $1.15@1.25; gro. $11.50@12.00
Harper, Champion or Paragon doz. $1.25@1.50; gro. $13.00@13 50

Game—
Oneida Pattern.....*80@80c&5%*
Newnouse.....45&45&5%
Hawley & Norton.....65&5@65&10%
Victor (Oneida Pattern).....75@75&5%
Star (Blake Pattern).....60&5@60&10%

Mouse and Rat—
Mouse, Wood, Choker, doz, holes.... 8½@9c
Mouse, Round or Square Wire..... *doz. 85@90c*
American Pattern French Rat and Mouse Traps—
No. 1, Detroit Marty Pattern, ₱ doz. $4.50; in ½ gro. lots, ₱ doz.....$4.00
No. 2, Detroit Marty Pattern, ₱ doz. $3.25; in ½ gro. lots, ₱ doz.....$3.00
Detroit Marty Pattern Mouse, ₱ doz. $2.00; in ½ gro. lots, ₱ doz.....$1.75
Eli Mouse Traps.....per doz. 40c
Eli Rat Traps.....per doz. $1.00
Marty French Rat and Mouse Traps (Genuine):
No. 1, Rat, Each $1.12½; ₱ doz. $12.00
No. 3, Rat, ₱ doz. $6.00; case of 50 $5.25 doz.
No. 3½, Rat, ₱ doz. $4.75; case of 72 $4.25 doz.
No. 4, Mouse, ₱ doz. $3.50; case of 7 $3.75 doz.
No. 5, Mouse, ₱ doz. $2.75; case of 150 $2.25
Schuyler's Rat Killer, No. 1, ₱ gr. $30.00
No. 2, ₱ gr. $20.00; Mouse, No. 3, $18.00.....50%
J. M. Mast Mfg. Co.: Per gro.

	Mouse.	Rat.
Blizzard	No. 12, $5.00	No. 1, $9 50
Old Nick	No. 30, 2.22	No. 2, 8.40
Joker	No. 5, 2 10	No. 3, 8.40

Imp'd Snap Shot, Mouse, per gro., 2 hole, $2 40.
Imp'd Snap Shot, Mouse, per gro., 4 hole, $4 20.

Target—
Markle's, each.....$5.50

Trimmers Spoke—
Bonney's Nos. 1 and 2.....40%
Wood's No. 1.....50%

Trowels—
Disston Brick and Pointing.....30%
Disston Plastering.....25%
Disston "Standard Brand" and Garden Trowels.....35%
Never-Break Steel Garden Trowels.....gro. $6.00
Peace's Plastering.....30%
Rose Brick and Plastering.....25&5%
Woodrough & McParlin, Plas'ring.....25%

Trucks, Warehouse, &c.—
B. & L. Block Co.:
New York Pattern.....50&10%
Western Pattern.....60&10%
Handy Trucks.....per doz. $16.00
Grocery.....per doz., $15.00
Daisy Stove Trucks, Improved pattern ₱ doz. $18.50
Model Stove Trucks.....₱ doz. $18.50

Tubs, Wash—

	No. 1	2	3
Galvanized, per doz.	*$4.75*	*5 25*	*6.00*

Galvanized Wash Tubs (S. S. & Co.):

No.	1	2	3	10	20	30
Per doz.	$5 25	6.00	6.75	6.50	7.00	8.00

Twine—Miscellaneous—

Flax Twine—	BC	B.
No. 9, ¼ and ½-lb. Balls	21½c	23½c
No. 12, ¼ and ½ lb. balls	17½c	19½c
No. 18, ¼ and ½-lb. Balls	15½c	17½c
No. 24, ¼ and ½-lb. Balls	15 c	17 c
No. 36, ¼ and ½-lb. Balls	14½c	16½c

Chalk Line, Cotton, ½-lb Balls.....*22@22½c*
Cotton Mops, 6, 9, 12 and 15 lb. to doz.....*8c*
Cotton Wrapping 5 Balls to lb according to quality.....*11c@17c*
American 2-Ply Hemp, ¼ and ½-lb. Balls.....*13@14c*
American 3 Ply Hemp, 1-lb. Balls.. *13@14c*
India 2-Ply Hemp, ¼ and ½-lb. Balls (Spring Twine).....*8c*
India 3-Ply Hemp, 1-lb. Balls.....*8c*
India 3-Ply Hemp, 1½-lb. Balls.....*7c*
2, 3, 4 and 5-Ply Jute, ½-lb. Balls.... *8@9c*
Mason Line, Linen, ½-lb. Balls...*45c*
No. 20, Mattress, ¼ and ½-lb. Balls.37c
Wool, 3 to 6 ply.....*5@5½c*

Vises—
Solid Box.....*50c&5@50&10%*

Parallel—
Athol Machine Co.:
Simpson's Adjustable.....40%
Standard.....40%
Amateur.....25%
Bonney's.....40%
Columbian Hdw. Co.....40%
Fisher & Norris Double Screw....15&10%
Hollands':
Machinists'.....40%
Keystone.....65&5%
Lewis Tool Co.....20@30%
Massey's Perfect.....15@20%
Massey's:
Clincher.....80@40%
Combination, Quick Adj.....40%
Woodworker's.....15%
Merrill's.....20%
Miller's Falls.....50&10&10%
Parker's:
Victor.....20@25%
Regulars.....20@25%
Vulcan's.....40@45%
Combination Pipe.....55@60%
Prentiss.....20@25%
Sargent's.....40%
Smith & Hemenway Co.:
Machinists.....40%
Jewelers.....33⅓%
Snediker's X, L.....33⅓%
Stephens'.....33⅓%

Saw Filers'—
Bonney's, No. 1, $13; No. 3, $16.....50&5%
Disston's D 3 Clamp and Guide, ₱ doz $30.....25%
Reading.....60%
Wentworth's Rubber Jaw, Nos. 1, 2 and 3.....45&50%

Wood Workers'—
Wyman & Gordon's Quick Action, 6 in., $6.00; 9 in., $7.00; 14 in., $8.00.

Miscellaneous—
Bignall & Keeler Combination Pipe Vise.....60%
Parker's Combination Pipe:
87 Series.....60%
187 Series.....60&5%
No. 870.....40%

Wads—Price Per M.

B. E., 11 up	*60c*
B. E., 9 and 10	*70c*
B. E., 8	*80c*
B. E., 7	*80c*
P. E., 11 up	*$1.00*
P. E., 9 and 10	*1.25*
P. E., 8	*1.50*
P. E., 7	*1.50*
Ely's B. E., 11 and larger	*$1.70@1.75*
Ely's P. E., 12 to 20	*$3 00@3.25*

Dis. 15%

Wagon Jacks—
See *Jacks, Wagon.*

Ware Hollow—Cast Iron, Hollow—
Stove Hollow Ware:
Ground.....60%
Unground.....65%
White Enameled Ware:
Maslin Kettles.....70%
Covered Ware:
Tinned and Turned.....40%
Enameled.....50%
See also *Pots Glue.*

Enameled—
Agate Nickel Steel Ware, list Nov. 1, '01.....50&20%
Iron Clad Ware.....70&10%
Lipman Enameled.....40&10%
Never Break Enameled.....50%

Tea Kettles—
Galvanized Tea Kettles:

Inch	6	7	8	9
Each	45c	50c	55c	65c

Steel Hollow Ware.
Avery Spiders & Griddles.....65@65&5%
Avery Kettles.....60%
Porcelained.....50&5@50&10%
Never Break Spiders and Griddles.....65&5%
Never Break Kettles.....60%
Solid Steel Spiders & Griddles.....65&5%
Solid Steel Kettles.....60%

Warmers, Foot—
Pike Mfg. Co., Soapstone.....40@40&10%

Washboards—
Solid Zinc: ₩ doz
Crescent, family size, bent frame.$3.00
Red Star, family size, stationary protector.....$3.00
Double Zinc Surface:
Saginaw Globe, family size, stationary protector.....$2.65
Cable Cross, family size, stationary protector.....$2.90
Single Zinc Surface:
Nalad, familysize, open back perforated.....$2.40
Saginaw Globe, protector, family size, ventilated back.....$2.25
Brass Surface:
Brass King, Single Surface, open back.....$3.00
Nickel Plate Surface:
No. 1001 Nickel Plate, Single Surface.....$3.00

Washers—Leather, Axle—
Solid.....85c10c10@85c10c10c10%
Patent.....85c10@85c&20%
Coil: ⅞ 1 1⅛ 1¼ Inch.
9c 10c 11c 13c per 100
Iron or Steel
Size bolt.... 5-16 ⅜ ½ ⅝ ¾
Washers....$6.60 5.10 4.40 4.20 4.00
In lots less than one keg add ½c per lb., 5-lb. boxes add ½c to list.
Cast Washers—
Over ½ inch, barrel lots, per lb......1½@1¾c

Washer Cutters—
See *Cutters, Washer.*

Washing Machines—
See *Machines, Washing.*

Water Coolers—
See *Coolers, Water.*

Wedges—
Oil Finish.....*lb. 2.90@3.10c*

Weights
Hitching—
Covert's Saddlery Works.....60&10%
Sash—
Per ton, f.o.b. factory:
Eastern District.....*$25.00*
Western, Central and Southern Districts.....*$25.00*

Well Buckets, Galvanized,
See *Pails, Galvanized.*

Wheels, Well—
8-in., $1.6 @1.80; 10-in., $2.00@2.25; 12-in., $2.50@2.65; 14-in., $4.00@4.25

Wire and Wire Goods—
Bright and Annealed:
6 to 9.....72½c&5@72½&10%
10 to 18.....72½c10c72½c10c5%
19 to 26.....75c10c72½@75c10c72½%
27 to 36.....75c10c71½@80c2½%
Galvanized:
6 to 18.....70@70c5%
19 to 26.....72½c5@72½c10%
27 to 36.....72½c10@73½c10c5%
Coppered:
6 to 9.....70c5@70c10%
10 to 18.....70c10@70c10c5%
19 to 26.....75c7½@75c10c2½%
27 to 36.....75c10@75c10c5%
Tinned:
6 to 14.....75@75c7½%
15 to 18.....72½c5@75%
19 to 26.....70c5@70c5c5%
27 to 36.....70@70c5%
Annealed Wire on Spools...70@70c5%
Brass and Copper Wire on Spools......60@60c5%
Brass, list Feb. 26, '96.....20%
Copper, list Feb. 26, '96.....15%
Cast Steel Wire.....50%
Stubs' Steel Wire.....*$6.00 to £. 40%*
Wire Clothes Line, see *Lines.*
Wire Picture Cord, see *Cord.*

Bright Wire Goods—
List April 1, 1901...85c10@85c10c10%

Wire Cloth and Netting—
Galvanized Wire Netting.....80c10@80c17½%
Painted Screen Cloth per 100 ft.....$1.10@1.15
Light Hardware Grade:
2-8 Mesh, Plain (8c. list) sq. ft.....1¾@2c
2-8 Mesh, Galv. (8c. list) sq ft..2½@2¾c

Wire, Barb—
See *Trade Report.*

Wire Rope—
See *Rope, Wire.*

Wrenches—
Agricultural.....75&5@75c10c5%
Baxter Pat'rn S Wrenches.70@70c5%
Drop Forged S.....45@45c5%
Acme.....60&10%
Alligator.....70%
Bull Dog.....70%
Bemis & Call's:
Adjustable S.....35&5%
Adjustable S Pipe.....40%
Brigg's Pattern.....30&10%
Combination Black.....40&5%
Combination Bright.....40%
Cylinder or Gas Pipe.....55%
Extra Heavy.....45%
Merrick's Pattern.....50%
No. 3 Pipe, Bright.....55%
Boardman's.....33⅓%
Coes' Genuine.....40&10&5&5%
Coes' "Mechanics'".....40&10&10&5&5%
Donohue's Engineer.....40&10%
Dudly Auto.....50&5@50&10%
Eagle.....50&10%
Elgin Wrenches.....40%
Elgin Monkey Wrench Pipe Jaws...33⅓%
Gem Pocket.....30%
Hercules.....70%
W. & B. Machinist:
Case lots.....50&10%
Less than case lots.....50&5%
Improved Pipe (W. & B.).....60%
Solid Handles, P.S. & W.....50@50&5%
Stillson.....65%
Triumph.....60&10%
Vulcan Chain.....50%

Fruit Jar—
Perfection Fruit Jar Wrenches, ₩ gro.$6

Wrought Goods—
Staples, Hooks, &c., list March 17 '98.....90@90c5%

Yokes Neck—
Covert Saddlery Works, Trimmed.....70%
Covert Saddlery Works, Neck Yoke Centers.....70%

Yokes, Ox, and Ox Bows—
Fort Madison's Farmers & Freighters'.. list net

Zinc—
Sheet.....*lb 6 c@6½c*

PAINTS, OILS AND COLORS—Wholesale Prices.

White Lead, Zinc, &c.
Lead, English white, in Oil.....7½@ 9⅜
Lead, American White, in Oil:
Lots of 500 ℔ or over.....@ 6
Lots less than 500 ℔.....@ 6¼
Lead, White, in oil, 25 ℔ tin pails, add to keg price.....@ ⅛
Lead, White, in oil, 12½ ℔ tin pails, add to keg price.....@ 1
Lead, White, in oil, 1 to 5 ℔ assorted tins, add to keg price.....@ 1⅛
Lead White, Dry in bbls.....5½@ 6
Lead, American. Terms: On lots of 500 lbs. and over, 60 days, or 2% for cash if paid in 15 days from date of invoice.
Zinc, American, dry.....₩ ℔ 4½@ 4⅝
Zinc, Paris, Red Seal, dry.....@ 5⅝
Zinc, Paris, Green Seal, dry.....@ 6⅛
Zinc, Antwerp Red Seal, dry.....@ 6⅛
Zinc, Antwerp, Green Seal, dry.....@ 5⅜
Zinc, V. M. French, in Poppy Oil, Green Seal:
Lots of 1 ton and over.....12 @12½
Lots of less than 1 ton.....12¼@12¾
Zinc, V. M French, in Poppy Oil, Red Seal:
Lots of 1 ton and over.....10¾@11¼
Lots of less than 1 ton.....11@11½
DISCOUNTS.—V. M. French Zinc.—Discounts to buyers of 10 bbl. lots of one or assorted grades, 1%; 25 bbls., 2%; 50 bbls., 4%.

Dry Colors.
Black, Carbon.....₩ ℔ 5 @ 8
Black, Drop, Amer.....4 @ 7
Black, Drop, Eng.....7 @11
Black, Ivory.....12 @21
Lamp, Com.....4½@ 6
Blue, Celestial.....₩ ℔ 4 @ 6
Blue, Chinese.....30 @35
Blue, Prussian.....28 @34
Blue, Ultramarine.....3 @12
Brown, Spanish.....½@ 1
Brown, Vandyke, Amer.....1¾@ 2½
Brown, Vandyke, Foreign.....2½@ 3
Carmine, No. 40.....₩ ℔ 2.05@2.75
Green, Chrome, ordinary.....5 @ 6½
Green, Chrome, pure.....19 @26
Lead, Red, bbls. ½ bbls. and kegs:
Lots 500 ℔ or over.....@ 5½
Lots less than 500 ℔.....@ 6
Litharge, bbls. ½ bbls. and kegs:
Lots 500 ℔ or over.....@ 5½
Lots less than 500 ℔.....@ 6
Ocher, French Washed.....1¾@ 1¾
Ocher, Dutch Washed.....4¾@ 5
Ocher, American.....₩ ton $10.00@15.00
Orange Mineral, English..₩ ℔ 8½@ 9¼
Orange Mineral, French.....11¾@ ..
Orange Mineral, German.....8½@9¼
Orange Mineral, American.....7¾@ 8
Red, Indian, English.....4½@ 8½
Red, Indian, American.....3 @ 3½
Red, Turkey, English.....4 @ 6
Red, Tuscan, English.....7 @10
Red, Venetian, Amer..₩ 100 ℔. 50@1.50
Red Venetian, English, ₩ 100 ℔.1.80@2.00
Sienna, Italian, Burnt and Powdered.....₩ ℔ 3½@ 7½
Sienna, Ital., Raw, Powd.....3½@ 7½
Sienna, American, Raw.....1½@ 2
Sienna, American, Burnt and Powdered.....₩ ℔ 1½@ 2
Talc, French.....₩ 100 ℔ $1.25@1.50
Talc, American.....90 @1.10
Terra Alba, French, ₩ 100 ℔ . 95 @1.00
Terra Alba, English.....95 @1.00
Terra Alba, American No. 1....85 @85
Terra Alba, American No. 2....45 @50
Umber, Turkey, Bnt. & Pow. ₩ ℔ 2½@ 3½
Umber, Turkey, Raw & Powd. 2½@ 3½
Umber, Bnt. Amer.....1½@ 2
Umber, Raw, Amer.....1½@ 2
Yellow, Chrome.....10½@25
Vermillion, American Lead.....10 @40
Vermillion, Quicksilver, bulk ... @70
Vermillion, Quicksilver, bags.... @71
Vermillion, English, Import.. .80 @95
Vermillion, Chinese.....$1.05@1.20

Colors in Oil.
Black, Lampblack.....12 @14
Blue, Chinese.....36 @40
Blue, Prussian.....32 @36
Blue, Ultramarine.....13 @16
Brown, Vandyke.....9½@13
Green, Chrome.....10 @12
Green, Paris.....@24
Sienna, Raw.....10 @13
Sienna, Burnt.....10 @13
Umber, Raw.....9½@12
Umber, Burnt.....9½@13

Miscellaneous.
Barytes, Foreign, ₩ ton.....$19.00@21.00
Barytes, Amer. floated.....19.00@20.00
Barytes, Crude, No. 1.....9.00@10.00
Chalk, in bulk.....₩ ton 2.50@ 2.60
Chalk, in bbls.....₩ 100 ℔ ..@ 35
China Clay, English..₩ ton 12.00@17.50
Cobalt, Oxide.....₩ 100 ℔ 2.30@ 2.50
Whiting, Common..₩ 100 ℔ .40@ .60
Whiting, Gilders'.....45½@ .65
Whiting, extra Gilders'.....55@ .68

Putty.
In bladders.....$2.25
In bulk.....2.25
In cans, 1 ℔ to 5 ℔.....3.25
In cans 12 ℔ to 25 ℔.....3.25

Spirits Turpentine.
In Southern bbls.....53 @53½@
In machine bbls.....55½@56 @

Clue.
Cabinet.....₩ ℔ 11½@16
Extra White.....18 @23
French.....12 @40
Irish.....13½@16
Low Grade.....9 @12
Medium White.....14½@16½

Animal, Fish and Vegetable Oils.
Linseed, City, raw.....₩ gal..46 @47
Linseed, City, boiled.....48 @49
Linseed, State and West'n, raw 45 @47
Linseed, raw Calcutta see l.....@75
Lard, Prime.....87 @88
Lard, Extra No. 1.....65 @68
Lard, No. 2.....52 @56
Cotton-seed, Crude.....34 @35
Cotton-seed, Summer Yellow, prime.....30½@40
Cotton-seed Summer Yellow, off grades.....37½@38
Sperm, Crude.....@ ..
Sperm, Natural Spring.....71 @73
Sperm, Bleached Spring.....74 @76
Sperm, Natural Winter.....75 @77
Sperm, Bleached Winter.....78 @80
Tallow, Prime.....03 @04
Whale, Crude.....@ ..
Whale, Natural Winter.....46 @47
Whale, Bleached Winter.....48 @49
Menhaden, Crude, Sound.....@ ..
Menhaden, Light Strained.....32 @33
Menhaden, Bleached Winter...34 @35
Menhaden, Ex Bleached Winter 36 @37
Cocoanut, Ceylon.....6½@ 6¾
Cocoanut, Cochin.....7½@ 7¾
Cod, Domestic.....33 @35
Cod, Newfoundland.....36 @37
Red Elaine.....48 @49
Red Saponified.....₩ ℔ 6½@ 6½
Olive, Italian, bbls.....53 @ 58
Neatsfoot, prime.....55 @56
Palm, prime, Lagos.....₩ ℔ 5½@ 6

Mineral Oils.
Black, 20 gravity, 25@30 cold test.....₩ gal. 10½@12
Black, 29 gravity, 15 cold test. 11½@12
Black, summer.....10 @11½
Cylinder, light filtered.....15½@18½
Cylinder, dark filtered.....14½@17
Paraffine, 903-907 gravity.....12½@13
Paraffine, 903 gravity.....11½@12
Paraffine, 883 gravity.....9½@10½
Paraffine, red, No. 1.....12½@13
In small lots ½c advance.

THE IRON AGE

The oldest paper in the world devoted to the interests of the Hardware, Iron, Machinery and Metal Trades, and a standard authority on all matters relating to those branches of industry.

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CURRENT METAL PRICES.

DECEMBER 31, 1902.

The following quotations are for small lots. Wholesale prices, at which large lots only can be bought, are given elsewhere in our weekly market report

IRON AND STEEL—

Bar Iron from Store—

Refined Iron:
1 to 1¾ in. round and square } ₩ lb 2.15@2.20¢
1⅛ to 4 in. x ⅜ to 1 in. }
1¼ to 4 in. x ¼ to 5-16 ₩ lb 2.20@2.30¢
Rods—⅜ and 11-16 round and square. ₩ lb 2.40@2.50¢
Angles: Cts ₩ lb
3 in. x ¼ in. and larger 2.30
3 to 3½ in. x 3-16 in. 2.75¢
1⅛ to 3 in. x ⅛ in. 2.75¢
1⅛ to 2¾ in. x 3-16 in. and thicker 2.50¢
1 to 1¼ in. x 3-16 in. 2.55¢
1 to 1¼ in. x ¼ in. 2.60¢
1 to 1¼ x ⅜ in. 2.70¢
⅞ x ¼ in. 2.80¢
⅞ x ⅜ in. 3.70¢
⅞ x ½ in. 4.20¢
½ x 3-32 in. 3.00¢
Tees:
1 in. 2.80¢
1¼ in. 2.75¢
1⅛ in. and larger 2.50@3.00¢
Channels, 3 in. and larger 2.50@3.00¢
Bands—1¼ to 6 x 3-16 to No. 8 ₩ lb 2.50¢
"Burden's Best" Iron, base price ₩ lb 3.30¢
Burden's "H. B. & S. Iron, base price ₩ lb 3.10¢
"Ulster" ₩ lb 3.15¢
Norway Bars 3.75@4.25¢
Norway Shapes 4.00@4.50¢

Merchant Steel from Store—

per lb
Bessemer Machinery 2.10 to 2.20¢
Toe Calk, Tire and Sleigh Shoe 2.30@3.00¢
Best Cast Steel, base price in small lots 7½¢

Soft Steel Sheets—

¼ inch	2.50¢	No. 14	2.90¢
3-16 inch	2.60¢	No. 16	3.00¢
No. 8	2.65¢	No. 18	3.30¢
No. 10	2.70¢	No. 20	3.30¢
No. 12	2.80¢	No. 22	3.40¢

Sheet Iron from Store.

Black.

	One Pass, C. R. Soft Steel	R. G. Cleaned.
Nos. 14 to 16	₩ lb, 2.90	3.10¢
Nos. 18 to 21	₩ lb, 3.00	3.20¢
Nos. 22 to 24	₩ lb, 3.10	3.30¢
Nos. 25 and 26	₩ lb, 3.20	3.40¢
No. 27	₩ lb, 3.30	3.50¢
No. 28	₩ lb, 3.40	3.60¢

Russia, Planished, &c.

Genuine Russia, according to assortment ₩ lb 11½@14¢
Patent Planished ₩ lb A, 11¢; B, 10¢, net.

Galvanized.

Nos. 14 to 16 ₩ lb, 3.10@3.15¢
Nos. 18 to 20 ₩ lb, 3.35@3.40¢
Nos. 22 to 24 ₩ lb, 3.65@3.70¢
No. 26 ₩ lb, 3.90@3.95¢
No. 27 ₩ lb, 4.20@4.35¢
No. 28 ₩ lb, 4.50@4.55¢
No. 30 ₩ lb, 5.65@5.70¢
No. 20 and lighter, 36 inches wide 25¢ higher.

Foreign Steel from Store—

Best Cast ₩ lb 15 ¢
Extra Cast ₩ lb 18 @ 20 ¢
Swaged, Cast ₩ lb 16 ¢
Best Double Shear ₩ lb 15 ¢
Blister, 1st quality ₩ lb 13 ¢
German Steel, Best ₩ lb 10 ¢
2d quality ₩ lb 9 ¢
3d quality ₩ lb 8 ¢
Sheet Cast Steel, 1st quality ₩ lb 15 ¢
2d quality ₩ lb 14 ¢
3d quality ₩ lb 13 ¢
R. Mushet's "Special" ₩ lb 46 ¢
" " Annealed ₩ lb 75 ¢
" " "Titanic" ₩ lb 19 ¢
Hobson's Choice XX Extra Best ₩ lb 35 ¢
Jessop Self Hardening ₩ lb 45 ¢
Seamans' "Nelson" Steel 40 ¢
Hobson's "Soho" Special Self-Hardening ₩ lb 43 ¢

METALS—

Tin—

Duty.—Pigs, Bars and Block. Free.	Per ₩
Banca, Pigs	26½@27 ¢
Straits, Pigs	26½@27 ¢
Straits in Bars	27½@28 ¢

Tin Plates—

American Charcoal Plates.

Calland Grade:
IC, 14 x 20 $6.25
IX, 14 x 20 7.75
Melyn Grade:
IC, 14 x 20 5.75
IX, 14 x 20 7.25
Allaway Grade:
IC, 14 x 20 5.25
IX, 14 x 20 6.35

American Coke Plates—Bessemer—

IC, 14 x 20 ..... 108 ₺ ..... $4.50@4.60
IX, 14 x 20 ..... $5.70@5.75

American Terne Plates—

IC, 20 x 28 $9.00
IX, 20 x 28 $11.00

Copper—

DUTY: Pig, Bar and Ingot and Old Copper free. Manufactured, 2½¢ ₩ lb.

Ingot—

Lake 12¼¢
Casting 12 ¢

Sheet and Bolt—

February 2, 1902. Net.

Prices, in cents per pound. Sheet 10 x 60.

Not wider than	Not longer than	And longer than	24 oz. & over, 60 lb. sheet, 30 x 60 and heavier.	28 oz. to 64 oz. 25 to 90 lb.	24 oz. to 32 oz. 18¾ to 25 lb.	16 oz. to 24 oz. 12½ to 18¾ lb.	14 oz. and 15 oz. 11 to 12½ lb.	12 oz. and 13 oz. 9½ to 11 lb.	10 oz. and 11 oz. 7¾ to 9½ lb.	8 oz. and 9 oz. 6¼ to 7¾ lb.	Lighter than 8 oz.
Ins.	Ins.	Ins.									
30	72	.....	18	18	18	18	19	20	21	24	27
30	96	72	18	18	18	18	19	21	24	27	
30	.....	96	18	18	18	18	20	24	27		
36	72	.....	18	18	18	18	20	22	25	28	
36	96	72	18	18	18	18	20	24	27		
36	120	96	18	18	18	19	21				
36	.....	120	18	18	19	20					
48	72	.....	18	18	19	21	22	25	28		
48	96	72	18	18	19	21	23	26			
48	120	96	18	18	20	22	26				
48	.....	120	18	19	20	24					
60	72	.....	18	18	19	21	24	29			
60	96	72	18	18	20	22	27				
60	120	96	18	19	21	24					
60	.....	120	19	20	22	26					
72	96	.....	18	19	21	26					
72	120	96	18	20	23	28					
72	.....	120	19	21	26						
108	96	.....	19	21	24						
108	120	96	20	22	25						
108	.....	120	21	23	27						
wider than 108	132	.....	22	24							
	.....	132	24	23							

Rolled Round Copper, ¾ inch diameter and over, ₩ lb 1¾¢.
Circles, Segments and Pattern Sheets, 3¢ ₩ lb advance over price of sheet Copper required to cut them from.
Cold or Hard Rolled Copper 14 oz. ₩ square foot and heavier, 1¢ ₩ lb over the foregoing prices.
Cold or Hard Rolled Copper, lighter than 14 oz. ₩ square foot, 2¢ ₩ lb over the foregoing prices.
All Polished Copper, 20 in. wide and under, 1¢ ₩ lb advance over the price for Cold Rolled Copper.
All Polished Copper, over 20 in. wide, 2¢ ₩ lb advance over the price for Cold Rolled Copper.

Planished Copper—

1¢ ₩ lb more than Polished Copper.

Copper Bottoms, Pits and Flats—

14 oz. to square foot and heavier, ₩ lb 22¢
12 oz. and up to 14 oz. to square foot, ₩ lb 23¢
10 oz. and up to 12 oz., ₩ lb 25¢
Lighter than 10 oz., ₩ lb 28¢
Circles less than 8 in. diameter, 2¢ ₩ lb additional
Circles over 13 in. diameter are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1¢ ₩ lb extra.

Copper Wire—

Hard and Soft Drawn—B. & S. Gauge.
List Feb. 23, 1901.

Nos....0000 to 8	9 and 10		11 and 12
	Base		⅛¢ ₩ lb adv.
Nos..... 13	14	15	16
	⅛¢	1¢	1⅛¢ ₩ lb adv.
Nos..... 17	18	19	20
	1⅛¢	2¢	2¼¢ ₩ lb adv.

Seamless Brass Tubes—

Standard always Stubs' gauge, unless otherwise ordered.
Feb. 6, 1899. Net. Outside Diameter.

Stubs' W.G.	B. & S. W.G.	¼	5-16	⅜	7-16	½	9-16	⅝	¾	⅞	1	1¼	1½
4-11	3- 9	.....	.....	.....	.....	33	31	30	29	28	27	25	24
12	10	.....	.....	37	35	33	31	30	29	28	27	25	24
13	11	.....	.....	37	35	33	31	30	29	28	27	25	24
14	12	.....	41	37	35	33	31	30	29	28	27	25	24
15	13	.....	42	38	36	33	32	31	30	29	28	26	25
16	14	.....	43	39	37	34	33	32	31	30	29	26	25
17	15	.....	44	40	38	35	34	33	32	31	30	27	26
18	16	51	45	42	39	36	35	34	33	31	30	28	27
19	17	52	47	43	40	37	36	35	34	33	32	30	29
20	18–19	54	49	44	41	39	38	37	36	35	34	32	31
21	20	56	51	46	43	41	40	39	38	37	36	35	34
22	21	57	56	47	44	42	41	40	39	38	37	37	36
23	22	59	61	50	46	44	43	42	41	40	39	39	39
24	23	61	66	53	48	46	45	44	43	41	40	40	41
25	24	63	71	56	51	49	47	46	45	43	43	44	45

Copper Bronze and Gilding Tube, 3¢ ₩ lb additional

Iron Pipe Sizes—Brass

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5 6 inch
36 32 20 27 21 21 21 21 21 21 23 23 25 27 28¢ ₩ lb
Copper, Bronze or Gilding Tubes, 3¢ ₩ lb additional

Brazed Brass Tubing.

(*To No. 19, inclusive.*) June 6, 1898.
Brown & Sharpe's gauge standard.

	Per ft.
Plain Round Tube, ¾ in. up to 2 in.	$0.35
" " ⅞ " ¾ "	.30
" " 1 " ⅞ "	.28
" " 1⅛ " 1 "	.41
" " 1¼ " 1⅛ "	.48
" " 1½ " 1¼ "	.65
" " 1¾ " 1½ "	1.00
" " 2 " 1¾ "	1.50
Smaller than ½ inch	Special
2 inch to 3 inch, to No. 19, inclusive	.38
3 inch	.40
Over 3 inch to 3½ inch, inclusive	.45
Over 3½ inch	.50

Bronze and Copper, advance on Brass List, 3 cents.
Discount from list 35%

Roll and Sheet Brass—

(*Brown & Sharpe Standard Gauge.*)

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than	2	12	14	16	18	20	22	24	26
and including	12	14	16	18	20	22	24	26	
To No. 20 inclusive	.22	.23	.25	.27	.29	.31	.33	.36	
Nos. 21 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	
Nos. 25 and 26	.23	.24½	.27	.29	.31	.33	.35	.38	
Nos. 27 and 28	.23	.25	.28	.30	.32	.34	.33	.39	

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.
Wider than	26	28	30	32	34	36	38	40
and including	28	30	32	34	36	38	40	
To No. 20, inclusive	.39	.42	.46	.50	.55	.60	.65	*
Nos. 21, 22, 23 and 24	.40	.43	.47	.51	.56	.61	.68	
Nos. 25 and 26	.41	.44	.48	.52	.57	.63	.71	
Nos. 27 and 28	.42	.45	.49	.53	.58	.65	.75	

* Special prices not less than 80 cents.
Add 1¼¢ ₩ lb additional for each number thinner than Nos. 28 to 38 inclusive. Discount from List 35%

Wire in Coils. List February 26, 1896.

Brown & Sharpe's gauge the standard.	Com. high brass.	Low brass.	Gilding bronze and copper
All Nos. to No. 10, inclusive	$0.23	$0.27	$0.28
Above No. 10 to No. 16	.23½	.27½	.28½
No. 17 and No. 18	.24	.28	.32
No. 19 and No. 20	.25	.29	.33
No. 21	.26	.30	.34
No. 22	.27	.31	.35
No. 23	.28	.32	.36
No. 24	.30	.34	.38
No. 25	.32	.36	.40
No. 26	.35	.39	.43
No. 27	.38	.42	.48
No. 28	.42	.46	.51
No. 29	.45	.49	.54
No. 30	.48	.52	.62
No. 31	.51	.55	.67
No. 32	.55	.59	.73
No. 33	.59	.63	.82
No. 34	.64	.68	.95
No. 35	.70	.74	1.30
No. 36	.76	.80	1.50
No. 37	1.00	1.04	1.70
No. 38	1.30	1.34	2.00
No. 39	2.00	2.00	3.25
No. 40	2.60	2.60	5.75

Discount, Brass Wire, 35%; Copper Wire, Nat.
List November 16, 96.
Spring Wire, 2¢ ₩ lb advance.

Tobin Bronze—

Straight, but not turned, Rods, ⅜ to 3 in. diameter, ₩ lb. net 17¢
Finished Piston Rods, ⅜ to 2½ in. diameter, ₩ lb net, 18¢
Other sizes and extreme lengths, special prices.

Spelter—

Duty: In Blocks or Pigs, 1¢ ₩ lb
Western Spelter 5¼@5½¢

Zinc.

Duty: Sheet, 2¢ ₩ lb.
600 lb casks 6½@6⅝¢ | Per lb 7@7¼¢

Lead.

Duty: Pigs and Bars and Old, 2½¢ ₩ lb. Pipe and Sheets, 2½¢ ₩ lb.

American Pig	4.45@4½¢
Bar	5 @5⅛¢
Pipe	6½¢ 20% off
Tin Lined Pipe	12½¢ 20% off
Block Tin Pipe	35¢ net
Sheet Lead	7¼¢ 20% off

Old Lead in exchange, 3½¢ ₩ lb.

Solder.

½ & ½ guaranteed 17 @17½¢
No. 1 14½@15 ¢

Prices of Solder indicated by private brand vary according to composition.

Antimony—

Duty, ¼¢ ₩ lb.

Cookson	@6½¢
Hallett's	7⅜@7¾¢
U. S.	7¼@7½¢

Aluminum—

Duty: Crude, 8¢ ₩ lb., Plates, Sheets, Bars and Rods, 13¢ ₩ lb.

No. 1 Aluminum (guaranteed over 99% pure), in ingot for remelting:
Small lots ₩ lb 37¢
100-lb lots ₩ lb 35¢
No. 2 Aluminum (guaranteed to be over 90% pure), in ingots for remelting:
Small lots ₩ lb 34¢
100-lb lots ₩ lb 33¢

Aluminum Sheet, B. & S. gauge. 50 lb or more	6-in.	14-in.	24-in.
Wider than	14-in.	24-in.	30-in.
And including	₩ lb.	₩ lb.	₩ lb.
Nos. 13 to 19	$0.42	$0.44	$0.47
No. 20	.44	.46	.49
Nos. 21 to 23	.46	.48	.51
No. 24	.46	.50	.53
No. 25	.47	.51	.54
No. 26	.47	.54	.59
No. 27	.48	.57	.62
No. 28	.48	.57	.64
No. 29	.49	.60	.69
No. 30	.50	.64	.77

Note.—Lots of less than 50 lb 5¢ ₩ lb extra.

Aluminum Wire, B. & S. Gauge.

Larger than No. 9	₩ lb 40¢	No. 15	₩ lb 43¢
No. 9 to No. 10	₩ lb 40½¢	No. 17	₩ lb 50¢
No. 11	₩ lb 41 ¢	No. 18	₩ lb 55¢
No. 12	₩ lb 41½¢	No. 19	₩ lb 60¢
No. 13	₩ lb 42 ¢	No. 20	₩ lb 65¢
No. 14	₩ lb 42½¢	No. 21	₩ lb 85¢

Old Metals.

Dealers' Purchasing Prices Paid in New York.

Heavy Copper	₩ lb 9¼¢
Light and Tinned Copper	₩ lb 8¼¢
Heavy Brass	₩ lb 7 ¢
Light Brass	₩ lb 5½¢
Lead	₩ lb 3½¢
Tea Lead	₩ lb 3 ¢
Zinc	₩ lb 3½¢
No. 1 Pewter	₩ lb 17½¢
No. 2 Pewter	₩ lb 8¾¢
Pure Aluminum, Sheet	₩ lb 22¢
Cast Aluminum	₩ lb 17¢
Tin Plate scrap	₩ ton $4 50@5 00
Wrought Scrap Iron	₩ gross ton $16.50@16 75
Heavy Cast Scrap	₩ gross ton $15.50@16.00
Stove Plate Scrap	₩ gross ton $11.00@ 11.50
Burnt Iron	₩ gross ton $9 00@ 9.50